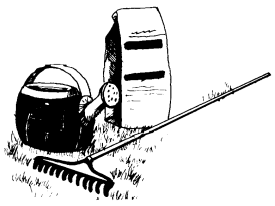

OVERCOMING SEED DORMANCY: TREES AND SHRUBS

Erv Evans, Extension Associate, Horticultural Science
Frank A. Blazich, Professor, Horticultural Science

Seed dormancy is nature's way of setting a time clock that allows seeds to initiate germination when conditions are normally favorable for germination and survival of the seedings. For example, dogwoods produce mature seeds in the fall, but conditions are not suitable for seedling survival at that time. Thus, dogwoods have developed a mechanism that keeps the seeds dormant until spring when conditions are favorable for germination, as well as, seedling growth and survival.

Viable seeds that do not germinate are said to be dormant. Dormancy can be regulated by the environment or by the seed itself. If a seed is not exposed to sufficient moisture, proper temperature, oxygen, and for some species light, the seed will not germinate. In this case, the seed's dormancy is due to unfavorable environmental conditions. On the other hand, some seeds may not germinate because of some inhibitory factor of the seed itself. This particular kind of dormancy consists of two general types: (a) seed coat or external dormancy and/or (b) internal (endogenous) dormancy.

Techniques to Break Dormancy

Seed Scarification — Seed coat (external dormancy) results from a seed's hard seed coat that is impervious to water and gases. The seed will not germinate until the seed coat is altered physically. Any process of breaking, scratching, or mechanically altering the seed coat to make it permeable to water and gases is known as scarification. In nature, this often occurs by fall seeding. Freezing temperatures or microbial activities modify the seed coat during the winter. Scarification can also occur as seeds pass through the digestive tract of various animals.

Scarification also can be forced rather than waiting for nature to alter the seed coats. Commercial growers scarify seeds by soaking them in concentrated sulfuric acid. Seeds are placed in a glass container and covered with sulfuric acid. The seeds are gently stirred and allowed to soak for 10 minutes to several hours, depending on the species. Various reference books provide appropriate concentrations and durations of treatment. When the seed coat has been modified (thinned), the seeds are removed, washed, and sown. Sulfuric acid can, however, be very dangerous for an inexperienced individual and should be used with extreme caution! Vinegar is safer (but less effective treatment) and can be used for species that do not have an extremely hard seed coat; the technique is the same as with sulfuric acid.

For mechanical scarification, seed coats can also be filed with a metal file, rubbed with sandpaper, nicked with a knife, or

cracked gently with a hammer to weaken the seed coat. Another method is hot water scarification. Bring water to a boil (212°F), remove the pot from the stove, and place the seeds into the water. Allow the seeds to soak until the water cools to room temperature. Remove the seeds from the water and sow.

Following scarification, the seeds should be dull in appearance, but not deeply pitted or cracked as to damage the embryo. Scarified seeds do not store well and should be planted as soon as possible after treatment.

Seed Stratification—The second type of imposed dormancy found in seeds is internal dormancy regulated by the inner seed tissues. This dormancy prevents seed of many species from germinating when environmental conditions are not favorable for survival of the seedlings. There are several different degrees or types of internal dormancy. One type of internal dormancy is "shallow" and simply disappears with dry storage. Many vegetable seeds display this type of dormancy. No special treatments are necessary to overcome this kind of dormancy.

However, another type of internal dormancy requires special treatments to overcome. Seeds having this type of dormancy will not germinate until subjected to a particular duration of moist-prechilling and/or moist-warm periods.

Cold stratification (moist-prechilling) involves mixing seeds with an equal volume of a moist medium (sand or peat, for example) in a closed container and storing them in a refrigerator (approximately 40°F).

Periodically, check to see that the medium is moist but not wet. The length of time it takes to break dormancy varies with particular species; check reference books to determine the recommended amount of time. This type of dormancy may be satisfied naturally if seeds are sown outdoors in the fall. Warm stratification is similar except temperatures are maintained at 68°F to 86°F depending on the species.

Seeds of some species exhibit what is known as double dormancy. This is a combination of seed coat (external dormancy) and internal dormancy. To achieve germination with seeds having double dormancy, the seeds must first be scarified and then stratified for the appropriate length of time. If the treatments are administered in reverse order, the seeds will not germinate. After these treatments, sow the seeds under the proper environmental conditions for germination.

Examples of Seed Treatments

Dogwood— Collect fruits (berries) when red and seeds are mature; if collection is delayed too long, birds may eat the berries. Remove the pulp, clean, and air dry, then provide moist-prechilling in a refrigerator for 3 to 4 months. Seeds can be planted in the fall, but they will not germinate until spring.

Camellia— Collect and plant in the fall before the seed coat hardens. If seeds are dry, soak in warm water for 24 hours before planting. Some individuals prechill the seeds until radicle (root) emergence and then plant the sprouted seeds.

Crabapple— Collect fruits as they begin to soften and when the seeds are brown. Remove the fruit pulp. Provide 1 to 4 months of cold-moist stratification. Seeds will germinate in 30 to 60 days.

Holly— Germinating holly seeds can be very difficult. Germination is extremely slow under outdoor conditions; it may take 2 to 3 years because of the holly's hard seed coat and an immature (rudimentary) embryo.

Goldenrain tree— Collect fruits when capsules turn brown, but before opening. Extract seeds, dry, and store in a cool dry place. Seed coats are very hard, and seeds will require scarification in order to germinate.

Redbud— Germination is inhibited by an impermeable seed coat and embryo dormancy. Soak for 30 minutes in concentrated sulfuric acid or vinegar followed by 3 months cold stratification. Mechanical scarification will yield satisfactory results.

Maple— Variation in dormancy exists with different species of maples. Spring-maturing seeds of such

species as red and silver maple should be collected immediately when mature, not permitted to dry, and sown immediately. For seeds of other species which mature in the fall, such as southern sugar maple, stratification for 90 to 120 days is necessary.

Nandina — Germination can be a challenge and is normally slow due to a rudimentary embryo and slow rate of embryo development. Fruits should be harvested when mature in the fall. Removal of the fleshy pulp is recommended and is easily accomplished by maceration. Seeds sown in the fall outdoors will germinate in 2 years.

Oak — Acorns of white oak do not become dormant. When planted in the fall, roots will emerge during winter; shoots will emerge in the spring. On the other hand, acorns of black oak germinate best if moist-prechilled for 1 to 3 months (if not planted in the fall). Acorns of red oaks should be planted in the fall or stratified for 1 to 3 months. Check references for individual species.

Pine — Seeds of southern pines such as loblolly pine have little or no dormancy and will germinate when extracted from cones in the fall. However, stratification for 30 to 60 days will increase the rate (speed) and uniformity of germination.

Southern magnolia — Remove fleshly pulp. Moist-prechilling for 2 to 4 months is needed (if not planted in the fall).

Southern wax myrtle — Fruits and seeds are treated as one and collected in the fall when mature. The fruits have a waxy coating which must be removed and can be accomplished by rubbing against a screen. Following wax removal, fruits/seeds are stratified for 90 days.

For Further Reading

Dirr, M. A. and C. W. Heuser, Jr. 1987. *The Reference Manual of Woody Plant Propagation: From Seed to Tissue Culture*. Varsity Press: Athens, Georgia.

Hartmann, H. T., D. E. Kester, F.T. Davies, Jr., and R. L. Geneve. 1996. *Plant Propagation, Principles and Practices*, 6th ed. Prentice Hall: Upper Saddle River, New Jersey.

Schopmeyer, C. S. (Tech. Coordinator). 1974. *Seeds of Woody Plants in the United States*. U. S. Department of Agriculture Forest Service: Washington, D. C. Agricultural Handbook 450.

Toogood, A. 1993. *Plant Propagation Made Easy*. Timber Press: Portland, Oregon.