

Native Seed Propagation Methods

Seed dormancy.

Dormancy is caused by physical and chemical barriers that keep seeds from germinating until conditions are favorable for the seedlings survival (usually spring but fall for some species). A physical or mechanical dormancy is a hard seed coat or waxy layer that keeps water out of the seed. Dormancy caused by physical barriers is overcome in nature in several ways including mechanical rubbing, freezing and thawing, digestion by soil microorganisms, passage through the digestive tracts of animals, and fire.

A chemical dormancy occurs when any of a number of chemicals are present in the seed coat that inhibits germination even when the seed is high in moisture content (fully imbibed) and ready to germinate. The chemical or chemicals responsible have to undergo a chemical change to something else or be leached or washed out of the seed before germination will occur. Chemical dormancy in seeds is broken when they are subjected to one or more of the following conditions:

1. Spending a period of time being cold.
2. Spending a period of time being cold and moist.
3. Being in the presence of light for a period of time.
4. Being in the absence of light for a period of time.

Most Missouri wildflowers that have chemical dormancy will lose them in nature by spending the winter in the ground cold and moist.

Types of Seed Treatments

We can fool nature and cause most dormant seeds to germinate. Some of the more common procedures used to overcome seed dormancy are listed and described below. You may need to use one or more to get a particular species to germinate

Scarification:

Place a sheet of sandpaper (medium grit) with the sandy side up in a beer or soda box (one with short sides) on a smooth or hard surface. Place the seeds to be scarified on the sandpaper. Now rub the seeds between the sandpaper for about ½ to 1 minute to wear holes in the impermeable surface of the seed.

A second method that works well with about 1/3 to 1 cup of seeds is to place the seeds in a blender and hit the low speed touch blend button several times. Let the blender speed almost reach the maximum of its low setting.

Cold Stratification:

Place dry seeds in a bag or jar. Label the seeds with name, date going into cold, and other information using a lead pencil. Place the seeds in a refrigerator for one to four months depending on the species. Storing in an unheated building away from rodents during the winter months will accomplish the same result.

Damp or moist Stratification:

Place seeds in a plastic zip-lock bag or plastic container with a tight fitting lid. Label the seeds on the outside of the container with the name and date. Add about equal volume of clean sand, peat moss, or sphagnum. Add water to moisten and then mix contents. The seeds should have a little excess water for the first 24 hours so they can absorb all they will. After 24 hours check the seeds and add more sand, peat, or sphagnum to absorb excess moisture if water is settling to the bottom of the container. The seeds should be moist not wet as they can drown in too much water. Store for the desired length of time at the specified

temperature, before attempting to germinate. Check the seeds occasionally to make sure they are not drying out.

When storing seeds moist at room temperature it is best to use peat or sphagnum moss instead of sand. Seeds that need a warm moist stratification usually require a cold moist stratification to follow before they will germinate. Spicebush and Michigan Lilly are examples.

Cold moist stratification:

Follow the procedures for damp or moist stratification and store at refrigerator temperature or try one of the following:

Sowing seeds outdoors in beds in the fall or early winter will achieve the same result. The seeds will germinate in the spring when the temperature and moisture are right. If conditions are excessively dry during March and April, water the bed lightly about once a day to keep the surface moist. A light straw mulch will help prevent drying.

Another method is to plant the seeds in pots flats or tray as described in "germinating seed indoors", below. Store the container and moist seeds outside in a cold frame or cover with a pane of glass and place on the north side of a building out of direct sunlight to give them the desired cold period. Small pots containing a packet quantity of seed can be put in a plastic ziplock bag. Check the seeds frequently to keep them moist.

Freezing and thawing:

Freezing and thawing of the seeds seems to speed up the stratification process compared to storing them at a constant refrigerator temperature.

Light:

Expose the seed to light during germination. Either don't cover the seed at all or cover very lightly.

Hot water:

Pour hot water (170-212 deg F) over the seeds and let them sit overnight before planting.

Germinating Seed Indoors

The following are some general steps to follow when germination seeds indoors.

1. Use flats, pots, or trays that are about three inches deep. There should be drainage holes in the bottoms of the containers. The containers should be new or else used containers should be soaked in 10% Clorox solution.
2. Fill the container to the top with a moist soil less growing medium and level off. Use a germination mix if possible that contains small particles. There are many soil less mixes on the market that contain predominantly peat moss and vermiculite. The important thing they lack is weed seeds and the fungi that cause damping off of the seedlings.
3. Using a board, hand, or other flat surface mash the loose potting mixture down about $\frac{1}{4}$ to $\frac{1}{2}$ inch below the top of the container.
4. Sow seeds on the surface of the mix. Small seeds can be evenly scattered over the surface. Shaking them from a saltshaker may help. Larger seeds can also be scattered on the surface or planted in rows.
5. Cover the seeds to a depth that is about twice their diameter. Very small seeds like cardinal flower need no covering at all. The same fine particle germinating mix or fine sifted sphagnum or peat moss can be used to cover seeds.
6. Clearly label and date the seeds in a way that the writing will not be washed away by water.
7. Large and small seeds can be watered from above with a watering can that dispenses small drops. Large

droplets tend to splash the seeds around a lot. It is often recommended that small seeds be watered from below by placing a container in a pan of water and letting the mix soak up the water.

8. Many people lay a piece of glass or plastic over the surface of the container to keep the seeds moist until they just begin to germinate. If this is done, don't keep the seeds in direct sunlight or they may become too warm. The 3 inches of germination mix holds enough water to keep the surface moist during most of a 24 hr period without the use of a glass or plastic covering. This is assuming the air is still and sunlight is not intense.

Germinating Seeds Outdoors in Beds

Prepare a smooth seed bed when the soil is workable. Scatter seeds evenly over the area or plant in rows. Mulch the area with straw to cover 60-80% of the soil. Better yet, prepare the smooth seed bed and cover it with ½ to 1 inch of sawdust. Plant the seed bed and cover it with ½ to 1 inch of sawdust; depth depending on the size of the seed.

Do this planting in the fall and you will not need to water except when it is dry in the spring at the time the seeds should be germinating. Watering the first growing season during dry periods will make larger plants the first year.

Plants can be transplanted out of this bed the first year during the growing season with care, but the best time to transplant will be in March or early April of the second year when they are just beginning to grow again.

Species Propagation Guide

A Stratify in refrigerator for 2-3 months.

B Scarify seed and then stratify for 2-3 months in refrigerator.

C High % of germination with no treatment at all.

D Sow fresh seed immediately and keep watered. Germination occurs immediately.

E Two months warm stratification followed by 2-3 months cold stratification in refrigerator.

F Remove juicy pulp from seed and sow fresh seed outside in containers or ground immediately. Germination occurs the following spring.

Additional Reading:

Art, Henry W. 1986 A Garden of Wildflowers 101 Native Species and How to Grow Them. Storey Communications, Inc., Pownal, VT.

Hartmann, Hudson T. and Dale E. Kester. 1983. Plant Propagation Principles and Practices. 4th edition. Englewood Cliffs, NJ; Prentice-Hall.

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Phillips, Harry R. 1985. Growing and Propagating Wild Flowers. Chapel Hill, NC: Univ. of NC.

Rock, Harold W. 1981. Prairie Propagation Handbook. 6th edition. Hales Corners, WI; Wehr Nature Center.

Sullivan, Gene A. and Richard H. Daley. 1981. Directory to Resources on Wildflower Propagation. St Louis, MO; Missouri Botanical Garden.

Sperka, Marie. 1973. Growing Wildflowers, A Gardener's Guide. New York, NY; Charles Scribner's Sons. (out of print)

Seed Treatment of some Native Plants

No Treatment Needed (greater than 50% germination; seed needs to be stored dry for a minimum of 2 months before sowing)

Agastache nepetoides*	Grindelia lanceolata
Aquilegia canadensis	Helianthus spp.
Asclepias sullivantii*	Heliopsis helianthoides*
Aster oblongifolius	Heuchera spp.
Aster anomalus*	Hibiscus spp.
Aster laevis*	Liatris aspera*
Aster novae-angliae*	Monarda bradburiana*
Baptisia australis	Monarda fistulosa
Blephilia spp.*	Monarda punctata*
Campanula americana*	Pycnanthemum tenuifolium*
Ceanothus americanus	Ratibida pinnata*
Chamaecrista fasciculata	Rudbeckia hirta
Coreopsis lanceolata	Sedum pulchellum
Coreopsis tinctoria	Senna marylandica
Dalea purpurea	Silene regia
Desmanthus illinoensis	Solidago drummondii
Elymus canadensis	Solidago juncea*
Elymus virginicus	Solidago hispida
Erysimum capitatum	Solidago gigantea*
Gaura spp.	

*25% germination

Cold/Moist Stratification

2-3 months cold/moist stratification increases germination significantly. Approximately 75% of native Missouri prairie species need or benefit from this treatment.

Anemone spp.*	Asclepias spp.
Amsonia spp.	Aster spp.

Boltonia spp.
Cacalia spp.*
Callirhoe spp.
Campanula americana
Carex spp.*
Coreopsis spp.
Delphinium spp.
Echinaceae spp.
Eupatorium spp.
Gailardia spp.,
Gillenia stipulatus
Helianthus spp.,
Heliopsis helianthoides,
Liatris spp.,
Lobelia spp.
Matalea spp.

Monarda spp.
Parthenium spp.,
Penstemon spp.
Physostegia virginiana
Polytaenea*
Ratibida spp.,
Rudbeckia spp.
Silphium spp.,
Silene spp.
Solidago spp.,
Taenidia*
Verbena spp.
Verbesina spp.
Vernonia spp.
Veronicastrum virginicum
Zizia spp.*

Grasses

Andrapogon spp.
Aristida spp.
Bouteloua spp.
Bromus spp.
Chasmanthium latifolium

Danthonia spp.
Schizachyrium scoparium
Sorghastrum nutans
Stipa spartea
Tripsacum dactyloides

plants may require 3-4 months cold\moist stratification.

Sow Seed Outdoors Immediately After Collection

Many species have berries or fleshy seed pods. Remove seed from pulp immediately and then sow immediately outdoors. If sowing in containers, keep moist until germination the following spring. Seed goes dormant for many years if allowed to dry out.

Anemonella thalictroides
Arisaema spp.
Asarum canadensis
Camassia spp.
Cardamine spp.
Chelone spp.
Cimicifuga racemosa
Clematis spp.**
Delphinium tricornis
Dicentra spp.,
Dodecatheon spp.*
Erigenia bulbosa
Erythronium albidum.

Gentiana spp.*
Geranium maculatum
Hepatica spp.
Hydrastis canadensis
Hydrophyllum spp.
Iris spp.
Lilium michiganense**
Lithospermum spp.
Maianthemum racemosa**
Melanthium virginicum
Mertensia virginica
Phacelia purshii
Phlox spp.

Polemonium spp.
Podophyllum peltatum
Polygonatum biflorum**
Ranunculus spp.
Sanguinaria canadensis
Stylophorum diphyllum

Tradescantia spp.
Trillium spp.
Viola spp.

All tree and shrub species

** do not transplant seedlings for 1-2 years*

*** seed requires two seasons to sprout*

Underlined seed may be stored dry but needs to be sowed outdoors

SCARIFICATION AND BRIEF COOL\MOIST STRATIFICATION

Legume family: These seeds have a hard seed coat that needs to be nicked, sanded, or softened with boiling water. A small percentage of germination may occur without stratification, however, more even germination occurs if you provide 1 month of cold/moist treatment after scarification.

Amorpha spp.
Apios americana
Astragalus spp.
Baptisia spp.
Cercis canadensis
Cladrastus lutea
Dalea spp.
Desmanthus illinoensis

Desmodium spp.
Gymnocladus dioicus
Lespedeza spp.
Phaseolus polystachios
Schrunkia nuttallii
Senna marilandica
Strophostyles spp.
Tephrosia virginiana