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## GERMINATION TIPS FOR SCLEROCACTUS / PEDIOCACTUS / TOUMEYA

Several genera of North American cacti have special requirements for their germination. In addition to those mentioned in the title, these comments would apply to many *Opuntias* and to the northern species of *Echinocactus*. These species share certain ecological conditions, which is important when considering how to germinate and grow them. All of the species come from regions with a long, cold winter. From time to time, there will be snow that will melt slowly, since it is below freezing much of the time, and wet seeds on the soil surface. Then in the spring there will be frosts, snow, and light rain, so the seeds will experience occasional periods of moisture with cool temperatures. Then in the summer, the days heat up, warming the soil to very high temperatures. From time to time, there are late afternoon thunderstorms, so although most of the time the soil is dry in the summer, the soil will be wet for short periods of time. In the fall it is usually very dry, and the soil will dry out, setting the stage for the winter snows.

In cultivation, remember that the plants really enjoy a long, cold winter; nearly all species can easily take temperatures down to 0°F (-17°C) and lots of fresh air. In nature, there will be frosts very regularly for 5 to 6 months each year; *P. simpsonii* can have frost 9 to 10 months of the year.

For germination, try to simulate their natural conditions. A very good method is to use a germination chamber, which can be a metal, plastic, or plastic-lined wooden box. To plant seeds, fill pots about 90 percent full with soil, and sprinkle a layer of coarse sand and very fine stones over the soil surface. Then sprinkle the seeds over this, and press them into the soil with the smooth end of a small piece of wood. Cover the seeds with more of the coarse sand and tiny stones so the seeds are buried about three times their diameter.

People in temperate climates should sow the pots in the cold part of the winter and use unheated, well-ventilated frames. Here are some comments about a method that works:

(1) Plant your seeds and load the pots into a germination chamber. I recommend covering the chamber with a white bedsheet. This will raise the humidity in the box, allow light in, and allow air to pass through, keeping rot and fungal problems to a minimum. Spray the pots with a gentle mist to soak the pots. Place the chamber in an unheated frame so it can be exposed to freezing temperatures at night. Avoid placing the chamber in a place where days will create high temperatures; ambient winter temperatures are best. Keep the pots wet for 2-3 weeks, then let the pots dry out for two weeks. Resoak the pots with water so they are alternately wet and dry, both freezing and thawing.

(2) In the spring, when it stops freezing hard, many of the *Pediocactus* will germinate. Again, keep up the alternate wet and dry periods. *Pediocactus* will germinate and be fine, even when it freezes at night. Good temperatures at this time are around 35°F at night to 70°F during the day (2-20°C). Before seeds germinate, keep them quite moist for a few weeks by misting them often enough to keep the top layer of the soil moist. If nothing germinates, allow the pots to dry out for a couple of weeks, then resoak again until things start to germinate. When seeds come up, move the pots with the seedlings to a separate place for different care. The newly germinated seedlings cannot stay wet for long periods of time, so move them to a place where they get more air ventilation. Not all the seeds will come up at the same time. I suggest that when seeds come up, just worry about giving proper care to the seedlings and temporarily forget about the ungerminated seeds in the pots. When the seedlings are big enough to remove from the pot, you can resume the germination conditions. The pots with the seedlings must dry out from time to time; you can increase the intervals between waterings as they get older.

(3) This step describes summer conditions, which offer hot days, cool nights, and from time to time, a good deal of moisture. The *Opuntias*, *Sclerocactus*, *Toumeyia*, and *Echinocactus* will germinate primarily during this time. Your germination chamber in your frame could range from 50°F at night and up to 110°F during the day (10°C to 45°C). During the bright, hot days of summer, keep the white cloth over the ungerminated pots to protect them

from the sun. The seedlings need only the same shading that adult plants would receive. Part of the time, keep the pots moist by misting them often for about two weeks. Allow the pots to dry out for intervals of a few weeks, and then resoak. When seeds germinate at this and any other time, just worry about taking care of the seedlings and stop working on germinating the rest of the seeds until the seedlings are removed from the pot.

(4) In the fall, occasionally *Sclerocactus* or *Opuntia* seeds will germinate, but few will come up. You can make the dry periods longer for pots that have not germinated. Most Scleros and Pedios will have a burst of growth when the hot days of summer are past. When you see the seedlings growing, give them a couple of good waterings. The small, young seedlings can take the same cold as adults, so you can keep them in the unheated frame.

To summarize, in temperate climates with freezing temperatures in the winter, an unheated frame with a germination chamber inside works very well to germinate these seeds. You cannot keep a pot wet for extended periods of time because the seeds will just rot, so for an interval of about 2-3 weeks, you can mist the pots often enough to keep the contents of the pot moist. Then allow the pot to dry out for about two weeks and rewet them. When seedlings come up, remove the pots from the humid place in the germination chamber covered with white cloth. When seedlings are big enough to transplant, remove them from the pot and care for them much like you would adult plants of the same species. After you have removed the seedlings from the pot, you can replace this pot in the germination chamber and work on germinating more of the seeds. Some species will take up to five years to fully germinate, so allow this much time.

*Pediocactus* are primarily very active in the spring when hard frost is over and then again in early fall when the hot days of summer are over. In late fall many of them will bud; they hold the buds over the winter. It does not hurt the buds to freeze. In the spring the buds will swell quickly when it stops freezing hard at night and will flower. When you see them starting to grow in the spring, give them good waterings and some feeding, but allow the soil to dry between waterings. Most *Pediocactus* like a small pot with more frequent waterings. By late spring, they will have finished flowering; when the days turn hot, they will go dormant for the summer. Let them become dry so they shrink down into the soil a bit; in nature most species pull down into the soil and can go underground. Just give them very little water during the summer; it is fine if the plants have some wrinkles on the epidermis. In late summer and early fall, they will show signs of growth, so give them a few waterings, which improves flowering and growth the following spring. During the winter, they need a couple of waterings, but most of the time they can be dry.

*Sclerocactus* and *Toumeyas* on the other hand grow later in the year (late spring) when it is warmer, and they make a larger root system. In the winter keep them drier, but they need a little water to keep them going. The plants will become very active in late spring when the days warm, and need thorough waterings and feedings. In the summer, give occasional thorough soakings as they will grow later into the summer. By mid-summer, when it is very hot, they slow or stop growing, so they can sit dry at this time. During the winter, wait long intervals between watering; but some water is important and needed for the burst of growth and flowering the following spring. *S. polyancistrus* should be watered only in the late winter and spring and kept dry all summer.

I have found that these plants do very well on their own roots in an open sandy soil. They are planted out directly into the ground in an unheated greenhouse with open ventilation. *Pediocactus simpsonii* needs much more water than the other species; give them plenty of waterings in the spring and most of the summer. *P. knowltonii* needs a bit more than the other species, and it too goes dormant in the heat of summer when the soil dries out. *Echinocactus* and *Opuntia* species from northern regions grow and flower during the hot period of the year. During the late spring when days warm up and frost stops, the plants begin to grow. Flowering takes place from late spring into the summer over a longer period as long as warmth and moisture are present. They need only a few light waterings in the spring and fall when it is cool, and should be kept very dry during the winter. In the warm part of the year, from late spring to early fall, they can be moist much of the time with occasional dry intervals.

The common conditions for all of these temperate North American cacti is dry air most of the time, with a great difference between the daytime high and nighttime low. Even though it freezes hard at night, very often in the winter most days are warm enough to get above freezing.

They all like soils that are gritty and low in humus. The usual cactus compost has too much organic matter and humus for these plants. When you transplant, inspect the roots; if they are not growing well, experiment with your soil to improve the condition. You could use a soil like this: 50% coarse sand, 30% natural sandy loam soil, and 20% grit (pumice, perlite, etc.).