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GERMINATION TIPS

For best germination you will need to provide proper conditions. These factors include light, temperature, moisture, soil, age of seed, etc. All species have their own set of requirements, and it is very important to sort your seeds and to plant together those that have similar requirements.

The light is a factor mainly after the seeds have sprouted. Light controls the direction in which the tiny seedlings grow, the roots go away from the light into the soil, and the tiny stem grows up toward the light. For most cactus and succulent seedlings, the light level should be rather high. For the past few years, we have very successfully grown seedlings under shade cloth in greenhouses at almost the same light level that adult plants would receive. The seedlings themselves will tell you about the light requirements. If they are getting tall and lanky and will not stand up, they need more light. If they are bright red AND not growing, they have too much light. Many seedlings are naturally tinged red, so do not worry about this. Here in very sunny New Mexico, we grow seedlings under 60% shade cloth during the summer, none during the winter. In less bright areas, a lower shade cloth percentage, or even none, would be appropriate.

The temperature is a very important factor in germination, as many species will germinate only if the temperature pattern falls within certain limits. This limit depends mainly on how the species behaves in its natural setting. For example, summer-growing cactus like *Ferocactus* germinate best at higher temperatures, and strict winter-growing plants like *Mitrophyllums* germinate best at cool temperatures. We have found that varying the temperature during the day is very helpful. So simulate the natural swing present in a natural setting by having the temperature rise in the day and cool off at night. When the temperature swings like this, you are more likely to hit an optimum level for better germination.

Moisture is also very important, because the water has to be absorbed into the seed to allow germination to take place. During germination the water should be clean; do not use a lot of unnecessary chemicals before the seedlings are well up. Things like fertilizers will retard germination, so use primarily clean water. Some people like to use fungicidal products during germination; this should be done according to the instructions on the product.

The soil is very important for several reasons. The soil provides water, nutrients, and gases needed for germination and growth. There is no single universal soil mixture that is best for all cactus and succulents. As a general guide, we have found that these mixtures work well in most cases. For most North American cactus (except epiphytic species) and most mesembs and Chilean species: 50% coarse sand (for making cement) (finished soil can be a little alkaline) 30% natural sandy loam, screened 20% grit (pumice, perlite, etc.)

For South American cactus and most other succulents, except *Crassulaceae:*

50% coarse sand	or	1/3 coarse sand (finished soil slightly acidic)
50% sphagnum		1/3 sphagnum peat
		1/3 perlite

For tiny-seeded species, like *Crassulaceae,* and tiny cactus, like *Strombocactus, Parodia,* etc.

50% sphagnum peat	or	100% sphagnum peat, in sealed plastic bags
50% perlite		

Be very careful about the sand; look at several types, and make sure that it will not compact in age. Concrete sand from a sand-and-gravel company usually is a good type to look at first. A good sand should have different particle sizes and contain many small stones. The sandy loam soil should not be sterilized unless you have serious pests, like nematodes. Natural soil has very beneficial bacteria present that help plants grow much better. The odd weed seeds will sprout; pull most when they come up, but leave a few to help you "read" the soil moisture very well, because they quickly wilt when the soil dries out.

Fill the pot almost to the top with your mix, and lightly press it level with the smooth end of a small board. Carefully sprinkle the seeds over the surface. Tap the pot gently on the sides to work the seeds into the soil a little. Large firm seeds like *Peniocereus* can be pressed into the soil with the same small board. Large fragile seeds like *Aloe* can just be buried with additional soil mix so they are covered. Then cover the soil surface, burying the seeds with a layer of coarse grit, about 1/8th inch (3 mm) deep for most seeds, more for larger seeds. We use as the covering material coarse sandblasting grit, which is 1-2 mm grains. Very fine seeds like *Dinteranthus* can be sprinkled right on top of the grit, and you can mist the pot to work the seeds down below the top surface. The tiny-seeded types also prefer a more humid atmosphere during germination, so an enclosure to raise the humidity is very helpful. Distilled water is also helpful for tiny-seeded types until they have germinated.

After the pots are planted, we just set them in the greenhouse in a germination chamber where the sun can shine on them. We use a wooden frame, lined with plastic, to hold the pots, and cover the chamber with nylon window screen. Window screen as a cover allows air to freely move, which discourages problems like fungus and algae. After misting the chamber, the screen holds many tiny water droplets, which raises the humidity inside. We mist them frequently, depending on the weather conditions, just making sure the grit layer stays moist while the seeds germinate. Mist them heavily the first few days to load the pots with moisture and to stimulate the seeds to absorb water. After germination has started, back off slowly on the misting, but keep them moist most of the time. After the seedlings are all well up and starting to grow, slack off more on the water and let them dry out occasionally so they do not rot. This takes practice, and no firm schedule can be given. Some species are more sensitive to water; these are marked in the germination tips in the catalog. No seed should be kept constantly moist for weeks on end. Some species take extra time to germinate, and they should not be kept moist for an extended time. Keep them moist for a few weeks, then if no germination happens, allow the pots to dry out for about a week. Then remist the pot to soak it up with moisture again, and continue this cycle of wet/dry for several cycles. Some very hard to germinate species can take a few years to sprout. When the pots are well up and most of the seeds that will germinate have done so, remove the pot from this high-mist area and place the pot in a situation similar to that which adults would receive. We have had very little problem with damping off with this method. A fog nozzle on your hose is a very good way to provide adequate mist. We do not recommend transplanting until it is needed. Each time you move a seedling, it has to generate a root system, and this only retards growth. As long as the seedlings have room to grow and they are healthy, leave them in the same pot. For this reason, use a pot that will hold the seedlings for as long as practical. A suggestion is to plan on keeping the seedlings in the same pot for from one to two years, so avoid planting a high number of seeds in a small pot. If you do not have a greenhouse, start the seeds either where they receive sun for part of the day or start them under lights. When started under lights, you may have to give supplemental heating from below to give proper temperatures, as the light tubes do not provide warmth like natural sunlight does.

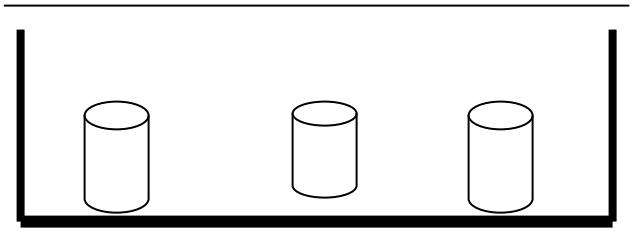
Most mesemb species quickly form rather large seedlings so, even though the seeds look small, do not be afraid to cover them. It is very important the light level be high enough to keep the seedlings compact. If they are getting too tall and lanky, increase the light level. We have gone to sorting the species by temperature and the time of year, and just start the seeds in the greenhouse in germination chambers. Doing this has eliminated the use of artificial lights or supplemental heating, which saves on your utility costs.

Fertilize your seedlings after the germination is essentially over. Then use water-soluble types and apply it with your regular waterings. We suggest a rather weak formula, something in the range of 1–2–2 or approximate. Add a trace element mix to your feeding so they have the essential nutrients. We suggest applying fertilizers during their active growth period—for cacti, mainly in the spring and summer, and for winter-growing succulents, during the fall and winter.

Some species have very fine seeds, things like *Strombocactus, Aztekium, Parodia, Dinteranthus, Echeveria,* etc. These types need a more closed humid atmosphere. An easy way to do this is to cover the germination chamber with an additional layer of clear plastic film. Keep this plastic film over the chamber until germination is well started. Then remove the plastic and keep the nylon screen over the chamber to help the tiny seedlings get established. Try to keep the soil moist for quite awhile, as these plants need a more careful and steady moisture level to help them get a root system established. The nylon screen cover can be left on for several months until the seedlings are well rooted. The fine-seeded types should be sown in their own chamber so you can give them the special care they require. If you have hard water, an occasional use of distilled water or rainwater will help with these species, because hard water deposits can choke off the young roots. The key factor with growing these types is frequent misting without turning the soil stagnant from excessive moisture, and this takes practice.

Another method is to sow them in milled sphagnum moss with the pot closed inside a plastic bag made moist with distilled water. Keep the bag closed until the seeds have finished germinating and they are starting to make a root system.

We enjoy hearing from people about their methods and results.



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