

Growing Succulent Plants in the Upper Midwest

Daniel L. Mahr

Succulent plants come from arid areas all over the world. They show incredible diversity of growth form and flowering. What they all have in common is that they evolved in natural habitats that are harsh: usually quite arid (at least seasonally so), often in intense tropical sun and very high temperatures, and often in nutrient-poor soil. The challenge to growers of succulent plants is to grow a beautiful, natural-looking "specimen" under conditions that rarely come close to those experienced by the plant in its native habitat. The challenge is easier if you live in a natural succulent plant habitat, such as Texas, Arizona, or southern California. However, beautiful cacti and other succulents can be grown virtually anywhere, even in places such as the upper Midwest.

In actuality, however, succulent plants grow in diverse habitats throughout the world and we can learn much about their cultivation by understanding how they live in their native habitats. Although in nature some types grow fully exposed to the tropical sun, many types grow under other bushes or in the shade of rocky outcrops. Also, many cacti and other succulents don't live in true deserts at all – many live in areas that can receive high rainfall during certain periods of the year (often during the summer) and then are "seasonally dry" meaning that the plants must be able to survive many months of dry weather. Plants that come from such areas are actually fairly well adapted to the upper Midwest. They can be moved outdoors during our spring and summer thunderstorms – they are well adapted to the warmth and moisture during this period – then they can be moved indoors and kept fairly dry during the frostier periods of autumn through early spring.

A few succulents can be grown to fairly good form with a minimum of special considerations; that is, they can be grown well when treated like other house plants. The majority of succulents can be grown fairly easily, but attention needs to be paid to soil, watering, and light requirements. There are a relatively few succulents that are incredibly difficult to grow, and even botanical gardens and experienced nurserymen have difficulty with these. However, with nearly 2000 types of true cacti, and another 8000 types of other succulents, there are plenty to choose from that can be grown very successfully under our conditions here in the upper Midwest. Consider the following factors to help improve your success.

Soil. All succulent plants require a well-drained soil mix.

In nature, succulent plants grow in a great diversity of soils. Some species grow only on rock faces where very little soil exists. Others grow in deep sandy soils. Some prefer quartz; others prefer granite or perhaps limestone. But a fairly universal rule is that very few grow in heavy soils that stay saturated with water for prolonged periods. In cultivation, succulent plants are subject to root rots which can rapidly kill the entire plant; these rots develop from overly wet soil conditions. Therefore, the most important characteristics of the soil mix are (1) rapid drainage after watering, and (2) to provide root structure and support for the plant.

Most dedicated growers of cacti and succulents make their own potting mixes, often starting with a conventional commercial potting soil and then adding materials for better drainage. A fairly standard mix consists of 1 part high-quality commercial potting soil to 1-4 parts drainage material. Drainage material includes such things as screened torpedo (building) sand (**not** fine sand), agricultural pumice (screened to 3/16-1/4"), lava rock (screened to 3/16-1/4"), and perlite (which has the disadvantage of floating to the surface during watering). Another source of drainage material is poultry grit, which comes in various sizes; it can be purchased at feed stores and other agricultural outlets. Highly fired baked clay pellets are used in the hydroponics industry and provide a very good soil component; suppliers can be found in many cities. Also, visit your local sand and gravel yard or landscape supply company for various types of landscaping gravels.

Use a higher percentage of **potting soil**

- if you water infrequently,
- for shallow pots or small pots (less than 2 1/4" diameter),
- for porous clay pots, or
- for more tropical succulents such as epicacti ("epiphyllums").

Use a higher percent of **drainage material**

- if you water more frequently,
- for large pots,
- for non-porous (plastic and ceramic) pots, or
- for very sensitive plants from more arid areas.

Avoid vermiculite as it holds too much water. Peat also tends to hold too much water and decomposes within a few years, resulting in a very poor soil that can lead to root rot. Many growers will not use peat in their mixes; however, commercial potting soils often contain peat. If you use a peat-based soil, use a higher proportion of drainage material, and plan to repot at least every 2-3 years.

Several potting soil manufacturers offer specialty mixes, including cactus and succulent mixes. These generally do not have enough coarse drainage components and should be augmented with such material before use. Some mail order cactus and succulent nurseries sell their own mixes, or components such as pumice. These are relatively inexpensive but shipping costs can be high.

Watering. Appropriate watering is necessary for plant health and growth. Over-watering can lead to disaster.

The type of potting soil and frequency of watering are closely related. At all times, allow the soil surface (to a depth of at least 1/2") to dry completely between waterings.

Water regularly during the growing season. This can be as often as daily if conditions warrant. During the growing period, the root system should not be allowed to go completely dry

for more than a few days at a time.

All other factors equal, watering will need to be done more frequently

- during active growth,
- during warm, dry weather,
- in porous clay, small, or shallow pots, and
- in well-drained soil.

If plants are in sub-optimum light, they should be watered less frequently to avoid etiolation (weak, spindly growth caused by low light).

When watering,

- use abundant water to flush salts from the soil,
- avoid allowing pots to sit in full saucers, and
- avoid overhead watering of rosette-forming plants (such as *Haworthia* and *Echeveria*), this to prevent rot. Overhead watering can also result in unsightly hard water spots on leaves and stems.

During the dormant period, water lightly, once every 2-4 weeks, and on warm, sunny days when additional days of sun are predicted. Caudiciform plants (leafy or vining plants with a fat, succulent base or thick tuberous roots) and other leafy succulents should be **very sparingly** watered during their deciduous period; they are very subject to rot.

Small globular cacti (such as *Lobivia*, *Rebutia*, *Sulcorebutia*, *Parodia*) from the Andes Mountains of South America bloom much more prolifically when given an enforced cool, dry resting period. Do not water between mid-October and the onset of flowering (usually February to April or May, depending on species).

Because of the salts, avoid watering with softener water.

Pots and Pottíng. The pot should match the size and requirements of the plant. For specimen plants, a decorative pot becomes the "frame" for the "picture."

A healthy root system rapidly extracts moisture from the soil and delivers it to the body of the plant. A small or unhealthy root system cannot accomplish this very well, and therefore the soil tends to retain moisture longer, which can result in rot. Therefore, it is better to "under pot" than "over pot".

Many types of cacti and other succulent plants are mature at a very small size, sometimes less than 1". These can be (and *should* be) grown in small pots for years.

Any type of pot can be used for succulents, but the following characteristics should be considered.

- Porous clay pots lose moisture more rapidly and therefore plants need more frequent watering. Such pots are good for plants that are highly sensitive to too much water.
- Plastic pots and glazed ceramic pots hold water longer.
- Square plastic pots provide greater root room than round pots, and are useful when space is limited.
- Shallow pots are generally better than deep pots, especially for small plants.
- Succulent plants are a horticultural art form and in this way are similar to bonsai. Bonsai pots have an excellent form and shape not only for plant growth, but also to display attractive specimens.

Sterilize pots before reusing by soaking one hour in a 10% solution of household bleach; then rinse thoroughly. Hard water deposits can be removed with Limes-Away or a vinegar solution.

Repotting is best done just after the beginning of the growing season (spring or early summer for most plants). After unpotting, inspect the root system and remove all dead roots; also look for mealybugs. Use *slightly damp* potting soil and **do not water for 7-10 days after repotting** to allow damaged roots to heal, this to avoid root rot. (The exception is very young seedlings, which should not be allowed to have dry soil during their first year of growth.) Start rewatering repotted plants gradually until good growth is noted.

Many plants respond very favorably to repotting, which should be done every 1-3 years, depending on the growth rate of the plant.

Nutrients. *Nutrients, like water, are required for plant health, growth, and flowering, but should not be overdone.*

Many succulents have evolved in soils that are poor in nitrogen, but may be rich in other nutrients.

Traditional succulent potting soils that contain a lot of inorganic drainage material tend to be nutrient-poor, and fertilization is necessary. Standard commercial soluble house plant fertilizers (such as a 15-30-15) are very acceptable for succulent plants, but the concentration should be reduced. More frequent fertilizing results in more continuous growth, with less signs of growth constrictions seen on many cacti. Commercial nurserymen fertilize with every watering during the growing period, but use a very weak solution, often only 10% of the label recommendation. Fertilizing should be done twice monthly during the active growth period, using 1/4 to 1/2 of the label-recommended rate.

Cacti and certain other succulents tend to bloom better when given a high phosphorous fertilizer (such as 5-25-5 or 10-50-10) during the previous summer and early fall. Use 1/4 to 1/2 the rate recommended for flowering house plants.

Trace elements should be added periodically, especially for plants in older soils.

Fertilize less if plants are in sub-optimum light to reduce the likelihood of etiolation.

Commercial potting mixtures which have an added nutrient base should not be further fertilized for the first 6-12 months.

Light. Light is the single most important factor to produce plants with the most natural appearance.

Achieving the correct balance of light can be the most challenging aspect of growing succulents. Optimum light intensity produces beautiful plant colors of green, brown, bronze, red, blue, and even white and black. Optimum light produces strong spination on cacti and euphorbias. And optimum light is essential for good blooming. Too little light results in tender plants, often of a blah pale green color, which tend to etiolate and not bloom. Too much light, especially when plants have been shaded, can result in yellowing, or worse, sunburn, which leaves an unsightly and permanent scar.

Different succulents have different light requirements; some grow in habitats without any shading, even under the most intense equatorial sun. Many of the medium and smaller types, however, grow under the protection of trees, shrubs, and rocks, or amongst grasses. These latter species cannot tolerate prolonged periods of direct, intense sunlight. However, here in the upper Midwest, even summer sun is less intense than in tropical areas, and plants that are accustomed to full sun can thrive without the shading that may be essential in their natural habitat.

The challenge for the home or small hobby greenhouse is to match types of succulents with the light that is available. Many types of succulents can be grown well on windowsills, in bay windows and mini-greenhouse window inserts, and even in bright rooms, providing the plants are as close as possible to the light source. Cacti and succulents can be grown very well in hobby greenhouses. Some light shading (30-50%) may be necessary during the hottest, brightest weeks of summer to avoid sunburn, but in northern latitudes many cacti and succulents thrive under unshaded conditions.

Besides light intensity, there are two other important aspects of light: angle and duration (photoperiod). When light is directional (either because it is coming from one direction, such as a window, or because the sun is low on the horizon in winter), plants tend to grow toward the light source. This can cause unsightly distortions of form of many types of succulents. Therefore, plants in directional light should be gradually but frequently rotated so the growth form is more normal.

Photoperiod, or the daily duration of light, is important because it is a cue for plants to bloom and to start or stop growth. Commercial nurserymen expose "Holiday cacti" to specific photoperiod treatments to be sure they bloom during Thanksgiving, Christmas, or Easter.

Many succulent hobbyists grow beautiful plants under artificial light. The key to natural growth is high light intensity; "fluorescent grow lights" by themselves do not provide the intensity needed by cacti and other succulents. For growing cacti and succulents, high intensity lights result in better growth than fluorescent lights.

Temperature. Most succulents grow best at temperatures in the range of 80-90°F, but will tolerate a wide range of temperatures.

Most succulents suffer above 100-110°F. At such high temperatures, growth stops. In extremely hot habitats, succulents are often spring and fall growers. Equatorial, tropical, and island species require a higher minimum temperature (50-60°). Succulents from higher latitudes and altitudes often can tolerate light frost, but freezing weather is better tolerated if the soil is dry. A few cacti and other succulents come from very cold locations and can be grown year-round outdoors in the upper Midwest. Considerable literature and internet sites are devoted to growing cacti and succulents in very cold climates.

Problems. By providing optimum growing conditions, many problems can be avoided.

Most problems can be diagnosed as being caused by (1) the physical environment, (2) plant pathogens, and (3) insects and mites.

The physical environment.

If plants lose their roots because of root rot, change your soil or watering conditions.

If the stems or succulent leaves of plants split open, this is an indication of too much water. The root system is healthy, but taking up more water than the plant can use for growth or eliminate through normal transpiration.

If roots are present but the plant fails to grow or bloom, it may be pot-bound or the soil structure or chemistry may have deteriorated (such as high pH or buildup of salts). Try repotting.

Try to keep humidity below 50%. Water cautiously during prolonged periods of high humidity.

If plants are of a dull green color, or become etiolated (stretchy), or don't bloom, they are probably not getting sufficient light. Try a brighter location or move them outdoors during the summer.

To avoid sunburn, don't abruptly move shaded plants into new locations of high light intensity. Make the adjustment gradually. During periods of bright sun and high temperatures, provide light shade, and/or air movement to reduce the possibility of sunburn.

Plant pathogens.

Root rots are the most serious. In some cases the roots will be lost but the plant above ground looks fine. Inspect the plant and, if there is sign of root rot, clean the plant, dust the bottom with rooting hormone containing fungicide, and repot into a better drained soil mix. New root growth will soon start.

Some root rots will become stem rots and the entire plant will be lost. This often occurs very rapidly. In some cases, growing tips may not yet be infected and cuttings can be taken. These should be treated with a fungicide and allowed to dry before re-rooting.

A few succulents are subject to disfiguring but not fatal stem rots which are usually localized in nature. In these cases it is best to take cuttings and start over. Try to reduce humidity and increase air circulation to prevent a reoccurrence. Discard the original plant to eliminate the inoculum.

Insects and mites.

Some succulents are relatively immune to most insect and mite pests. Mealybugs and spider mites are the most serious pests of cacti and other succulents. Mealybugs can often be in the soil as well as above ground. Additional pests can include aphids, whiteflies (generally only on leafy species), and thrips. Traditional control approaches (chemical, soap, washing, and hand removal) are all successful against most pests. In larger collections, more stringent measures may be necessary. Biological controls (especially lacewings, predatory mites, and whitefly parasites) can be used in greenhouses, but applications may need to be done regularly, and can be costly. Also, biological controls tend to work better in higher humidities than appreciated by succulent plants.

BE CAREFUL USING SOME LIQUID INSECTICIDES ON MEMBERS OF THE FAMILY CRASSULACEAE – SEVERE PHYTOTOXICITY CAN RESULT.

In summary....

Cacti and succulents are highly desirable decorative plants. Although sometimes thought difficult, many types can be grown very successfully (and easily) in the upper Midwest. By understanding how these plants thrive in their natural habitats, we can adjust soil, watering, lighting, and potting containers to match their needs, with very rewarding results.