



Succulents

Structure & Function













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What are Succulents?

The term "succulents" covers a broad range of plants. With the definition of a succulent varying between communities, it makes sense there is some confusion on what is considered a succulent and what isn't. At its most basic, a succulent is a plant that develops fleshy parts for the storage of water. It is often debated to include plants that use roots to accomplish this. By definition cacti are considered succulents but are often excluded from succulents by home gardeners. Succulent plants typically grow in dry, arid climates. They utilize an array of water- saving techniques to survive through most droughts. Succulents are very popular in the home gardening scene because of their drought resistant capabilities and striking appearance. You can find many different tips on growing, soil consistency and watering guides for succulents. Succulent enthusiasts have a large online community focused on aiding home growers. Soil consistency is the most important factor of growing succulents indoors. Succulents don't enjoy having wet feet, so well draining soil that consists somewhat of sand or gravel is a must.

While soil and gravel work just fine in most cases, I have used a soil-perlite based mixture using a 70-30 ratio respectively, Since I am located in a very cloudy, temperate climate I chose to buy a fluorescent tube specifically for plant growth as well as a small heat lamp. Most succulents will survive just fine in the winter in a sunny spot in your house but a lack of sun will cause a loss of color and minor wilting. While these plants can also survive colder



environments, they do not take frost very well and can kill your plants if left outside.

erricotta pots do the best to retain cool water and release it over time to the succulent. Whatever pot is being used needs to have a way for water to drain out on the bottom or the roots and base will rot. In most cases after watering the plant, the soil will dry up within 4 or 5 days. After the soil dries up, the plant can really be watered anytime you get around to it. They are capable of being ignored for even months at a time but I water my plants once a week. This is great for succulents in a warm, 'sunny' environment that is good for plant growth. In colder, cloudier environments they go into a dormant state and require less water. Following basic guidelines, it is extremely simple to have beautiful succulents in any environment.

Most succulents store water and nutrients in the leaves and/or stem. By having fewer, but thicker leaves, the plant can reduce loss of water through the surface by having less surface area. The leaves also have significantly fewer stoma (openings) on the surface than normal plants which reduces the water lost during respiration. The roots of many succulents tend to grow nearer to the top of the soil so they are able to absorb the moisture of a light dew or high humidity. Succulent roots do not absorb water by contact, but through the moisture in the air. This makes high drainage soil necessary or the roots will rot and succulents are likely to shrivel and turn black. With the wide variety of plants, each plant has its own take at water conservation. Here I have collected information of a few popular categories or genera of succulents and their adaptations



Aloe

Aloe plants are very common in the modern world due to the medicinal properties that is claimed to be possessed by these plants. Most common uses are associated with burn treatment and dermatology, but vary to even minimize ear infections and soothe asthma conditions. The genus of Aloe originates from southern tropics of Africa and the Arabian Peninsula. Many species of Aloe grow small spikes (bottom right) primarily for defens, but these also aid in water conservation. Spines add volume to the leaves of the plant while having less surface area exposed to the harsh sun than if the same volume was added to the length or width of the plant. Aloes are valued for ornamental designs as well as their medicinal properties. The broad, spiny, and often colorful leaves that give aloe their distinguishing look are often used for upright elements in succulent gardens.





Kalanchoe

he Kalanchoe genus is known for some species ability to propagate many new plantlets from ridges on the leaves. These Kalachoe plants have the distinct ability to propagate new plantlets while the plant is alive and in one piece (propagation will be discussed later). The plantlets will start roots and dangle from the edges of the broad leaves. Kalachoe daigremontiana (bottom) starts many new plantlets even while relatively small, often growing up to three feet tall and two feet in diameter. Having hundreds of plantlets with exposed roots allows the plant to efficiently absorb moisture in the air. It also has an odd habit of growing lateral roots above the ground to fully take advantage of the deserts chill morning dews. The leaves eventually get large enough to bend and touch the ground letting the dangling roots grab the soil and grow.

One way this Kalanchoe tomentosa deals with conserving water is by growing a fuzzy coat over its leaves. This is why its more commonly known as the Panda Plant (below). The fuzz creates a micro climate closer to leaves, reducing the air flow at the surface of the leaf which allows for cool, moisture filled air to collect at the leaf surface and cut down water lost during respiration.





Crassula

 $m{\gamma}$ rassula genus contains a large amount of \checkmark plants. This genus has species that are considered cactus as well as succulent plants in the horticulture community. A common form of Crassula (bottom left) grows axial symmetrical leaves alternating between X and Y. The sets of leaves then grow along the plants thin stem. This makes the plant capable of producing shade for the stem and lower leaves. These plants generally are curved upright plants but can curve over and take more of a vine structure. They do not grow very large so they are able to have relatively little surface area exposed to sun while still having large stores. Arguably the best known Crassula is the Jade plant. Extremely common in houses all over the world, these succulents are hardy and live well in moderate to hot climates.

Jade plants have recognizable rubbery leaves and often very trunk-like stems. This makes them good species to start a bonsai tree with. They are easier to manage for beginners due to their slow growth and easily manageable leaves. After selecting a healthy Jade plant, trim it to the desired shape and then trim the roots to fit your pot. As the plant grows, trim off any undesirable growth and guide the trunk with wires if necessary. This monstrose form of Jade, known as 'Gollum' Jade (**bottom right**), has many finger-like projections that can be trimmed down. As the plant ages, the trunk will grow and get a gnarled bark appearance.





Echeveria

he species in this genera unlike the other examples here which are mainly from Africa, are from Central America. Thriving in semi-arid areas of Mexico and South America. many of these plants are considered 'tenders' in the succulent community due to their soft, sometimes velvety leaves. While still very drought resistant, these plants are less adapted to harsher environments, doing best with a regular deep watering soak whenever the soil is dry. Leaves of Echeveria plants are more prone to shriveling when under watered than other succulents. It becomes very apparent when they need water. These plants are often capable of almost completely shriveling up in the drought season and then bounce back at the first solid rain of the season.





This dormant time makes up for their lack of water conserving methods shared by many other species. Echeveria also differ in the aspect that as the plant gets older, the leaves will fall of and die. These lie at the ground of the large plant and cover it in smaller rosettes. This is a reason may gardeners use them to cover an entire area. Like many succulent rosettes, the leaves on this plant grow in a Fibonacci sequence **(above & below)**.



Propagation

he driving force to survive creates amazing mechanisms of reproduction in succulents. Referred to as propagation, succulents are able to regrow roots, leaves and stems after being cut off the main plant. There are some key spots at which if cut, give the plant a good chance at being able to grow using the water stored in the rest of the leaf. Leaf and stem cuttings are often able to produce multiple off shoots from one cutting. This Echeveria (right) leaf cutting was able to produce two small rosettes. The new roots grow from the calloused edge of the cutting with bright pink tips. After 6 weeks (bottom left) the plants dug into the soil and have now rooted themselves. A larger leaf was taken from the Kalachoe daigremontiana (bottom center) and after 6 weeks many of the plantlets have rooted. One leaf of a Panda Plant (bottom right) has also grown two small stems and many roots. These do not need to be placed in the soil immediately as they still acquire moisture from the air and stores. It is better for the root to grow long enough to find soil itself and is strong enough to root itself somewhat.



Echeveria



Kalanchoe daigremontiana



Kalanchoe tomentosa



Conclusion

The tenacity of succulents can't be attributed to one thing in particular. While using the same principals and regular themes, each genus and even individual species develop highly specialized methods to conserve water. How each plant deals with the issues in its environment determines the appearance of the plant. This is a classic instance of the constant relationship of structure and function that guides all cellular life. The amazing abilities of these plants have given them strange and sometimes other worldly looks. These characteristics have amassed a huge following in the gardening community. Being almost impossible to kill growing indoors, they are the perfect plant to pot and forget about for months

at a time and can live for many years. While they are great plants for beginners, even succulent veterans enjoy making various arrangements of succulents. It becomes easy to find yourself buried to your neck in succulents once they become established and propagate.



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