

Desert Enigma: Where Did All Those Flowers Come From?

Deserts are known for their heat and dryness and, because of those factors, their paucity of vegetation. The Chihuahuan Desert is no exception. Months and occasionally years with no rain create a very arid environment where the temperatures may rise to 120°F in June. Survival during these times is difficult with very little green to be seen across the desert and yet, when the rains do return, even in small amounts, the desert is alive with plants growing and blooming. How do they do that? How do these desert plants survive the harshness and then reappear as if those last few years were nonexistent?

EVADING DESERT CONDITIONS

Some plants evade the desert conditions by becoming inactive. The ocotillo ([Fourquieria splendens](#)) is probably the most famous for this, only bearing leaves and flowers to produce seeds when there is enough rain. When conditions dry out, the leaves are dropped and the plant becomes dormant, looking like a clump of dead sticks blowing in the wind. Photosynthesis only occurs in the presence of chlorophyll, so a lack of leaves (where the chlorophyll is usually located) shuts down the plant's activities. Other plants may have leaves that are coated with oil or a thick wax to block out some of the sun's strength. Others may have thin hairs or spines to provide shade from the sun. Those same cactus spines may help collect moisture from a heavy morning dew or a light rain and then direct that moisture down toward the base of the plant. Some plants, such as the mesquite, evade desert conditions by sending their tap root down, way down, to reach the water table.

ENDURING DESERT CONDITIONS

In order to survive desert conditions many plants have found ways to endure the heat and aridity. Those desert plants that have been successful at collecting water must find ways to store that water for use during drier times. This is accomplished by having spongy cells in their leaves, stems, and/or roots. As moisture becomes available the tissue swells with the moisture and as the dry, hot air returns, the tissue slowly shrinks as the water is used.

The water collected by all plants is used to cool the plant and to carry out the processes of photosynthesis where light (from the sun), water, and carbon dioxide (from the atmosphere) are used to store energy in organic molecules needed by the plant for energy and growth. Many desert plants (including cacti and agaves) have refined this process so that only one tenth of the water used by tropical plants is needed for photosynthesis in these desert plants. In addition to the savings in water, the process, called CAM (for Crassulacean Acid Metabolism) only requires that the stomata of the plant (the pores that open to

the outside) be open during the night when temperatures and lower and humidity higher) as opposed to being open during the day and losing too much water. Desert plants have also modified their leaves, having a smaller surface area on which to collect heat. Since for many plants the leaves are the site of photosynthesis, it seems counterproductive to reduce their size when they are producing compounds the plant needs for energy. However, the CAM method for photosynthesis is so much more efficient these plants are not compromised. The cacti of the desert have modified their leaves into spines and the chlorophyll needed for photosynthesis is found in the stem of the plant. Those same modified leaves act to protect the plant from animals and as shade to reduce the temperature of the plant stem.

Once a plant has stored its water it must protect that store from animals seeking its life-saving moisture. There are basically three ways of doing this. A physical barrier of spines or thorns or stinging hairs can be used to discourage any attack. Many plants find this defense sufficient. Some plants use chemical warfare, adding a bitter taste to the stored moisture. Sometimes the bitter taste is a clue that the plant is storing a poison that will make the attacker too sick to carry on or that will kill the organism outright. Another way of protecting the stored water is to avoid where it can be attacked by growing on canyon walls or being protected by the camouflage of hiding in other desert plants so the attackers do not notice.

DYING TO ESCAPE THE HOT DRY DESERT

As rain begins to fall in the Chihuahuan Desert after months (years even) the desert wildflowers begin to appear, growing out of places that seemed devoid of anything living. Where did these plants come from and where will they go? These are the desert annuals that have been dormant seeds, lying buried in the desert soil, waiting for the return to good conditions so they can germinate. In its seed form, desert plants are almost indestructible. Surrounded by a hard protein coat that protects the embryonic plant from heat and aridity the seed may stay viable for more than ten years. Although the seed coat is water soluble it takes more than just a brief shower to begin the germination process. A late fall rain of over one inch will trigger the germination process in spring annuals by washing away the protective coating. Building the underground structures first, the plant reaches the point where it can support the above ground stem and leaves, usually during late winter when the temperatures remain cool enough for the plant to avoid being stressed by the heat. An occasional shower at this point allows the plant to become more robust. With the approach of spring and its longer, warmer days, the seedling begins the process of producing a flowering stalk and then flowers. This begins the final act in the life of an annual. With the flowers come the pollinators which allow the ovules to be fertilized and turned into seeds. As the seeds are produced the life cycle of that annual is over and it dries and disappears, leaving its seeds to begin the life cycle again when

conditions are right. Although this is the life cycle of a spring annual, there are also summer and autumn annuals that follow similar paths but are triggered by different conditions.

Although comparatively short-lived, the spring annuals provide an amazing sight during their brief existence. They have managed to completely avoid the worst of the desert conditions and, for those lucky enough to witness their blooming season, they have provided a display of stunning beauty in a land of oppressive conditions.





Posted by Patt Sims - September 6, 2013