

# Propagating in the Desert Southwest: What We Do and Why We Do It

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## INTRODUCTION

An important challenge in the American Southwest is to introduce newcomers to the exciting variety of landscape plants adapted to the desert climates. A major effort on the part of water companies is directed to reducing landscape water use. Commercial growers, botanical gardens, highway plantings, and public displays all showcase species that can be successful in landscapes with less than 10 inches of rainfall. For this reason, commercial propagation efforts focus mostly on species unique to areas of the world that have similar high light, low relative humidity, and extreme diurnal temperature ranges.

## CLIMATE

The USDA hardiness zones for the North American Deserts range from Zone 8 to Zone 11. Average temperatures in the Sonoran Desert range from below freezing on winter nights to over 100F (40C) on summer days. The diurnal range in any season is normally 30F. Rainfall in the Sonoran Desert is typically about 10 inches (25.4 cm) per year, about evenly divided between summer thunderstorms and gentler winter showers. Relative humidity in the driest seasons is normally under 10%. High irradiance levels are the norm; measurements often register above 10,000 fc (2000 microeinsteins  $m^{-2} sec^{-1}$ ) on a summer day.

## PROPAGATING FROM SEEDS

Species native to the desert environment have evolved unique survival mechanisms. Seeds normally ripen and dry down during the hottest driest months, so these mechanisms include at least one type of seed dormancy.

Many trees commonly grown in the Southwest nursery trade are members of the Fabaceae family. Examples include the genera *Prosopis*, *Cercidium*, *Olneya*, *Sophora*, *Cercis*, *Acacia*, *Erythrina*, and *Psoralea*. They exhibit seed-coat dormancy that requires some scarification effort (boiling water, acid soaking, or tumbling in sand) specific to the species. Other trees from the higher elevations (*Cupressus*, *Juniperus*) or sometimes from the lower river beds (*Celtis*, *Rhus*) require moist stratification from 3 to 10 weeks, depending on the species. More often than not, both dormancy restrictions occur to some degree.

Desert shrubs in the family Fabaceae (*Senna*, *Calliandra*, *Caesalpinia*, *Bauhinia*) grown from seed typically have seed-coat dormancy requiring scarification (sometimes only boiling water is sufficient; other times, acid is more efficient). Seeds from most plants in dry climates are considered classic orthodox seeds: easily dried and stored for many months. Very few seeds in desert ecosystems would be considered recalcitrant (*Quercus*, from the slightly higher grasslands, being one exception).

Cacti are hybridized for improved flower color and length of bloom time; many species are grown from seed by specialty producers. Cactus seeds normally require

no special treatment and are sown in March, in a very loose soil mixture which may include pumice and rough sand. Although misting the seeds is not beneficial, germination is enhanced if ambient temperatures are 80F (27C) and the relative humidity is raised with plastic enclosures. The best cactus hybridizers have begun to propagate their crosses vegetatively (see discussion of cactus grafting below).

Wildflowers are big business in the Desert Southwest. Seeds are harvested during the driest months — April, May, June, or October and November. Drying machines are not needed. Seeds typically have at least inhibitor dormancy (benefitting from soaking) and some are sensitive to high soil temperatures. Since most of the wildflower species are winter annuals that bloom from February through April, sowing outdoors is most successful in October when soil temperatures have dropped and rain can be expected. A variety of mixes is available for revegetation, home gardens, attracting wildlife, etc. If mixes bought for use in the lower elevations include species from cooler sites, these species may fail to germinate in future years due to lack of colder winter temperatures.

## CUTTINGS

The SW nursery industry has begun to offer patented and/or trademarked varieties of arid-adapted species — everything from trees to groundcovers. Since these must be propagated vegetatively, growers have correctly begun to pay more attention to the challenges of our hot dry environment.

Many woody species in the SW Deserts have two growth flushes — one from April through mid June, another after summer rains from September through October. Taking cuttings during these times often ensures better rooting success. Some of the legume trees are particularly sensitive to the succulence level or stage of growth, and have been found to root more readily if taken during April and May.

Despite the relatively warm climate, and even with a mist system, outdoor propagating set-ups result in less than optimal rooting success. The low relative humidity, high light levels, wind, and large temperature swings throughout the day do not provide the required benign environment favorable for root initiation. Even though desert trees, shrubs, and succulents have mechanisms to reduce heat load, the physiological process of root initiation seems to be most successful if the high light levels are reduced to approximately  $\frac{1}{4}$  to  $\frac{1}{3}$  of ambient noon levels, depending on the season.

To raise the relative humidity in a desert climate, both plastic enclosures and reliable mist systems (with quality components) are a non-negotiable requirement. The mist must turn on at least every 8 to 10 min throughout the day and preferably a time or two during the night. It is less important to have a climate-override feature, since light and atmospheric conditions are quite consistent on a monthly basis.

Because the mist needs to run so often, the medium must be very loose. Frequently, a heavy mix is the cause of leaf drop and stem softening in cuttings of many desert species. At the University of Arizona, we use coarse vermiculite mixed 1:1 with perlite. Mesh table tops or good air circulation reduce excessive medium wetness. Deep containers drain better, too, so trays or cones should be at least 4 inches deep.

Because most arid-adapted shrub, perennial, and groundcover species are fairly woody, auxin improves rooting success. We have found at the University of Arizona

that liquid formulations often induce roots more rapidly than the same strength in powder formulation possibly due to the light mix that might fail to hold a powder near the stem base.

To counteract the wide diurnal temperature swings, bottom heating on the mist table is normally turned on near the end of October when night temperatures are dipping to the mid-50s. We try to keep soil temperatures above 80F. Often the bottom heat system is sufficient to heat the house through the night. An important point is that the system must be regulated by a thermostat, since day temps throughout the winter may still be high enough to require full cooling.

In the Desert Southwest, fans and pads must be top of the line. The good news is that because of the low RH, the evaporative cooling principle works extremely well. Most of the year it is possible to reduce the temperatures a full 80% of the wet bulb/dry bulb differential. Shade cloth is often custom made for the houses, applied in early March and removed in November. Varying grades of the shade cloth can effect a noticeable reduction in heat load, and light levels may be lowered to a workable level inside the houses. Depending on the species (and growth stage) rooting may be improved if the mist areas are shaded further.

### **GRAFTING CACTI**

The states in the Desert Southwest are the source for cacti and succulents for a world market. Most of the landscape species are grown from seed or are propagated from stem sections or offsets. On the other hand, hybrids bred for improved flower size/color and unusual or novelty forms (crested cultivars, those lacking chlorophyll, thornless or misshapen forms) are sold to collectors or combined in cactus gardens, etc. Unusual scions are normally grafted onto a vigorous rootstock, for increased production and more rapid sales. The typical rootstock for this use is *Myrtillocactus geometrizans*, a rapidly growing species. One of the most innovative growers of unusual cacti has developed a "double cut" system where scion tips or even sections of four to five aureoles are grafted to the rooted stock. Grafts normally take in 2 weeks.

### **SUMMARY**

An increasing number of growers are introducing arid-tolerant species that will thrive as ornamental landscape plants in the desert climates of the world. However, propagating in the American Southwest is a challenge because of the extremely dry atmosphere, the large range in daily temperatures, and the high irradiance levels. In any arid subtropical country, the challenges would be similar. An understanding of the markets, desert species' growth patterns, dormancy requirements, and controlled climate technology will all serve to increase the availability of native and locally adapted taxa.