

Growing Agaves[®]

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Agaves are semi-succulent perennials that are generally stemless with firm, fibrous leaves arranged in a rosette pattern. Although agaves occur in a wide range of habitats they exhibit many of the adaptations that mark desert plants — tough, waxy leaf surfaces; succulence; wide, spreading root systems; and the ability to withstand amazingly high temperatures. These properties make them excellent garden plants and growing them can be interesting — sometimes challenging, but always highly rewarding.

I fall squarely into the camp of those who believe that the more you know about the plants you are trying to grow the more successful you will be. But I will admit right now that there is more about the physiology, pollination biology, growth determinators, and general natural history of agaves that are unknown than are known. Lots of what we do know is not the result of controlled experimental work, but has come through the long and consistent experience of many people who delight in these plants and have grown them for a long time.

Agaves are succulent or at least partially so. This means that they have specialized tissue to store water in times of reduced water. Succulent tissue in agaves is generally in the leaves, often only at the base or in close association with the stem. They are probably better thought of as semi-succulent.

Agaves come in a wide range of sizes from the 5 to 6 ft giants like *Agave sisalana*, *A. salmiana*, and *A. mapisaga* to the diminutive *A. parviflora* that is rarely over 6 inches tall.

Most agaves have teeth along the margin of the leaf and the leaf ends in a terminal spine that can be very sharp. Species like *A. shawii*, *A. gigantensis*, and *A. bovicornuta* are especially well-armed while *A. vilmoriniana*, *A. bracteosa*, and many forms of both *A. weberi* and *A. desmettiana* are nearly thornless.

Agaves also exhibit a wide range of growth habits with some like *A. zebra*, *A. ocahui*, and *A. geminiflora* growing as solitary individuals. But other species like *A. lophantha*, *A. toumeyana*, and *A. lechuguilla* form colonies of rhizotomous offsets (known as pups). Even among agaves that form pups there is a wide variation. Some form huge colonies, others set only a few throughout their life. Some species form pups throughout their life cycle, others only at the time they bloom.

Agaves live over more than one season which is often considered perennial but they are generally monocarpic, which means they bloom only once and then the plant dies. In a clump-forming species, this is rarely noticed because only the rosette that bloomed actually dies with all others continuing their life cycle. But in solitary plants it is the loss of the entire plant.

Blooms in agaves are extraordinary. All species send up towering inflorescences that are 8 to 10 times the size of the plant. The tiny (6 inches tall) *A. parviflora* blooms with an inflorescence that is 6 ft tall or more, and the large agaves like *A. salmiana* send up a flowering stalk that is over 30 ft tall. These inflorescences come in two general styles: spicate as in *A. vilmoriniana*, *A. lophantha*, and *A. schottii*, and paniculate as in *A. americana*, *A. angustifolia*, and *A. parryi*. The firm, waxy flowers are generally gold or yellow but are occasionally reddish and in one case

(*A. bracteosa*) are white. Seed is set in a capsule and is numerous within the capsules. At maturity seed are flat, thin, and black. It is common to seed white, brown, and black seed within a single pod but only black seed are viable.

Agave root systems are much like most succulents in that they are shallow, fibrous, and spreading radially from the plant. As in cacti, the root system becomes dormant during times of drought and the fine feeding roots are allowed to die off when soil moisture becomes low. And again in a similar pattern to many other succulents, root regrowth will respond almost immediately to available water regrowing the feeder roots in a matter of days. Such root systems are finely tuned to living where water is erratically or intermittently available. In terms of artificial or ornamental growth, it means that these plants demand superb drainage and grow best with deep irrigation at long intervals.

Propagating agaves is remarkably simple. Seed germinates within a month of sowing with no treatment. While not all species have been studied, generally agave seed remains viable for 3 to 5 years – occasionally longer – without special storage treatment. Agave seed will germinate in a wide temperature range, but optimal germination occurs at temperatures around 90°F or higher although I've had them germinate as low as 75°F.

Seed grows quickly and responds to standard nursery practice including aggressive fertilization. Seedlings tolerate being very crowded during the earliest stages of development and many growers take advantage of this trait to sow seed in flats or unsegregated growing trays. The seedlings are separated when they are large enough to handle about 2 to 3 inches tall. Even very small plants can have large, vigorous root systems and will grow quickly once they are separated. It is important to use a fast-draining mix and most growers find that a rock or gravel mulch on the surface improves both water retention and disease control.

The second strategy for propagation is to remove any or all of the rhizotomous offsets. Some agaves have enormous number of pups and by lifting and pulling the pups are quickly removed. If necessary, the rhizome can be cut to free pups with no detriment to the original plant. While this strategy is limited for large-scale production, it is useful in building up numbers and for highly prized specimens. Each plant is a clone and, depending on how old they are, can be of salable size within a few weeks of being lifted and potted. Removal of pups has no effect on either the mother plant or the pups – they are growing as two virtually independent plants by the time they are visible.

A third mechanisms that is unique to selected species of agave is the removal and rooting of bulbils. Bulbils are small plantlets that form on the flowering stalk after or during bloom. Careful inspection reveals a small, knob-like root tissue at the base of the plant. Bulbils can be removed anytime after they form, but rooting will be most successful if you leave them on the plant until they cease increasing in size and these small root projections form. Place them in a sterile medium, or a sand and gravel mixture, and keep evenly moist. Roots will form quickly and the small plants can be individually potted once they have begun to grow again.

Tissue culture is also practiced on many agave species and its use is increasing. It is an excellent tool for agave forms or cultivars that do not offset, or form hybrid forms that have been selected for particular traits.

In summary, growing agaves is generally simple and straightforward if you can provide the following requirements. All appreciate high light, but in the low des-

erts of the Southwest the full sun can be too much for many species. There, light shade or the shade from high-crown trees is advisable. Along the Pacific Coast or anywhere inland that is at least one U.S.D.A. Zone cooler than Phoenix, full sun is recommended. The same light requirements hold for young plants, even seedlings. The more light, the stronger the plant and the better growth and form it will have.

All species need excellent drainage. Many, especially the softer-leaved tropical species, can tolerate plenty of regular watering as long they are not permitted to remain in saturated conditions. In containers it is usually best to eschew the use of saucers (unless it is removed for watering), wicks, or automated watering systems. Seedlings and young plants can be watered as often as is necessary to prevent the soil from drying out completely. In the summer this can be daily in the Phoenix area, but is up to every 5 or 6 days in the winter. In containers, whether small or large the soil column should be nearly dry between waterings. Agaves respond poorly to mist or other constant overhead watering regimes.

Agaves generally grow in moderate to warm temperatures. There is rarely active growth when it is cold or when it is extremely hot. During the coldest part of the year be cautious with watering and be doubly certain that the soil is dry between waterings. Agave root systems rot quickly with too much water held around the roots. The same dynamic holds in the hottest part of the summer.

LITERATURE CITED

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The Effect of Invasive Plants on Native Ecosystems — How We Can Help®

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We all do the best we can to help create sustainable landscapes. But when that hot new bestseller comes along that's sure to perk up the bottom line, what do we do?

Invasive plants do not mean simply the loss of some pretty wildflowers in our nearest natural area. The eradication of invasive plants costs us, the taxpayer, \$13 billion per year (National Invasive Species Council, 2001). Total wholesale nursery receipts were \$13.3 billion in 2001 (USDA, 2002).

Forty-two percent of the species on the Threatened or Endangered lists are at risk primarily because of invasive plants (Pimentel et al., 1999). These plants alter natural landscapes, exclude native plants, cause species extinctions, reduce bird, game animal, and fish populations, alter water courses, are toxic to cattle and horses, and increase wildfire danger and intensity.

What can we do to ensure beautiful natural areas for our grandchildren to enjoy, in which there are abundant animals for recreation? We can:

- Check with our local agencies and parks to determine local problem species. Ensure that the invasive potential of a new plant is thoroughly assessed before introduction to the trade.