

# HOW TO PROPAGATE AGAVES AND CACTI FROM CUTTINGS AND SEED

Jack Kelly

## Introduction

Propagation of most cacti and agaves is a very simple procedure. Many varieties can be successfully propagated by both vegetative cuttings and from seed. This guide provides basic information that will help to insure successful results.

## Vegetative propagation

Vegetative propagation relies on the plant's ability to produce new roots and shoots from an existing part of the plant such as a stem or leaf. Some of the easiest cactus to propagate in this way include *Cereus*, *Cylindropuntia* (Cholla), *Echinopsis*, *Lophocereus*, *Mammillaria*, *Opuntia* (Prickly pear), *Stenocereus*, and *Trichocereus* hybrids.

The time of year has a great influence on the success or failure of plant propagation. The first step in the process is to determine which species root best in warm weather and which root best in still warmer weather. Taking cuttings during appropriate months of the year when temperatures at night are conducive to rooting and root development is the key to success. As a rule, cuttings taken when nighttime temperatures are 60°F (16°C) and above will root successfully. When cuttings are taken during inappropriate months of the year, rooting may be delayed or not occur at all.

When working with prickly pear (*Opuntia*) cuttings, agaves and other spiny plants, care must be taken to avoid being injured while handling the plants. Always wear gloves or use tongs; avoid contact with the plants.

Always take cuttings from healthy plants that are representative of that species. Do not propagate cuttings that are badly blemished, bruised, diseased, shriveled, rotted or otherwise not clean and healthy. The size of the cutting will depend on the species and the size of the parent plant. Cuttings may be several feet long (*Cereus peruvianus*) or as small a single pad (*Opuntia*).

*Opuntia* cuttings should be removed at the node, which is the area where the pads attach to one another. Globe shaped species such as Easter lily cactus and hybrids (*Echinopsis* and *Echinopsis* hybrids) are usually propagated by removing



Fig 1. Removing plantlets (right) from parent plant (left)

small immature globes or plantlets from the stock plant (Fig.1). The location of the cutting removal is not critical with columnar cactus, although cuttings from this or last year's growth generally root best.

The use of plant rooting compounds is not critical for successful rooting of many species of cacti although many commercial propagators will use them as 'insurance' to enhance rooting percentages. Sulfur is often used to help ward off invasion of the cutting by pathogens. It is essential that all cuttings be air dried until the soft inner tissue calluses over.



Fig 2. Mature plant with numerous 'pups' or offsets

Agaves are easily propagated by removing the offsets or 'pups' from the parent plant (Fig. 2). Always leave a small portion of the stem that connected the offset to its parent on the base of the offset. It is in this area where new roots will develop. If cut too close to the base of the offset, the roots will not form. All broken or damaged roots should be removed leaving about



Fig 3. Trimming roots of *Agave* offsets



Fig 4. Sticking offsets in prepared rooting mix



Fig 5. Rooted offset after 4 weeks



Fig 6. Bulbils on flower stalk of *A. murpheyi*

¼ inch (0.05cm) of the roots on the offset (Fig. 3). Since most of the root mass has been removed, planting the cuttings is as simple as gently pushing the agave offset into the prepared rooting medium (Fig. 4). The plant will re-initiate a new set of roots after planting in warm soil (Fig. 5).

Agave offsets can be planted directly into 1-gallon (3.8 L) containers. Once rooted, the offsets will start growing and a regular regime of fertilizing (with a soluble fertilizer) can begin. The young plants can remain in a 1-gallon container for a year without needing to be transplanted.

Some species of agaves produce miniature plantlets on the flower stalk (Fig. 6). These plants can be removed and individually potted up as with offsets. Roots will typically appear in 2 to 3 weeks.

## Cactus is easily propagated

The following is a step-by-step procedure for rooting cacti from cuttings:



Fig 7. Cutting being removed. Note slanted cut

First, remove the cutting from the parent plant by cutting the stem with a sharp knife. A serrated knife works well this procedure. The knife should be cleaned using a 10% bleach solution after making several cuts. This will help in limiting the occurrence of bacterial diseases.

Make the cut on pad cactus at the joint between pads. With columnar cacti, the cut can be made anywhere along the stem but should be made at a 45 degree angle (Fig. 7). This is to protect the



Fig 8. Cutting dipped in dusting sulfur (optional)

parent plant. A slanted cut leaves less chance of water collecting and standing in the wounded area. Square off the base of the cutting, dust with sulfur and/or rooting compounds (Fig. 8) and let air dry until the cut is callused over. If this step is not taken, the cutting may rot and have to be discarded. It may take up to several months to assure that the base of the cutting is fully callused (Fig. 9). The callus formed will protect the plant from most soil-borne diseases.



Fig 9. Fresh cutting (left) and callused cutting that has air dried (right)

Most cactus species are propagated during August—October when nighttime temperatures are 60° F (16° C) or above and soil temperatures are warm and conducive to rooting.

After the callus has formed, fill the containers with prepared propagation mix. The following soil mix is an appropriate medium for both seed and cuttings. Although there are many mixes used, most contain 50% pumice or perlite and 50% peat or compost. Although the mix may vary from one grower to the next, the ideal mix should have half organic matter and half inorganic material. The inorganic material will provide adequate aeration and drainage which is essential for rooting. Do not use animal manures in the mix as these may be a source of salt or other rooting inhibitors.

Cuttings should be placed deeply enough in the container so the cuttings will not fall over. Covering about 1/3 to 1/2 of the base of the cactus pad will provide this stability. Columnar cacti may need to be planted more deeply to achieve this goal. Irrigate the cuttings when the soil is slightly damp, and keep them in a bright area.

Light levels are important. The dappled shade of a tree will often provide a great location for rooting to occur. Cuttings placed in low such as under densely foliated trees will lead to thinning of the diameter of the cutting. The thinning of the diameter of the cutting will not totally disappear over time. Some species such as *Cereus peruvianus*, *Lophocereus*, *Pachycereus* and *Stenocereus* may be rooted in direct sunlight. With most species, rooting should occur within 4 - 6 weeks

in summer. For some species such as organ pipe cactus (*Stenocereus thurberi*), rooting may take several months.

Once the cuttings are rooted, the growing tip will show signs of new growth. At this time that the cuttings are becoming 'plump' indicating that roots have formed and that water and nutrient uptake has occurred. Cuttings may be grown in 1 or 2 gallon (3.8–7.6 L) containers for up to a year without requiring transplanting.

## Seed Propagation

Growing cacti and agaves from seed is an easy, economical way to build up large numbers of plants. It is also an opportunity to find a seedling that shows unique or unusual characteristics from the mother plant.

Always start with fresh, clean seed. The seed should be sown in shallow wide containers in a soil mix that assures good drainage, provides air and some organic matter to hold nutrients and moisture. Mixes that typically contain 50% inorganic material such as perlite or pumice are excellent. The other half of the mix should be either sphagnum peat or well composted organic material. Avoid animal manures as these may inhibit seedling establishment. Nighttime temperatures of 65°–70°F (18°–21°C) are conducive to good germination and growth.



Fig 10. Irrigating newly sown cactus seed



Fig 11. Agave seed scattered on prepared medium

the seeded pot in a bright warm outdoor location but not in direct sunlight.

To avoid 'damping off' problems during germination, sterilized medium will greatly reduce occurrence of this problem. Propagation medium can be sterilized by placing it in a kitchen oven at 350°F (176.7°C) for 30 minutes. A covering of plastic wrap or a plastic bag over the container will help retain moisture during the critical germination period.

Spread cactus seed evenly over the surface of the pot and very lightly cover with coarse sand to avoid covering the cactus seed too deeply. Place the container in a waterproof tray and fill with water up to ½ the height of the container and allow water to wet the medium from the bottom of the container (Fig. 10). With the larger agave seed, this covering material may be pumice or perlite (Fig. 11). Because agave seed is larger than cactus seed, overhead watering is not detrimental. Place



Fig 12. Agave seed germinating after two weeks



Fig 13. Cactus seedlings move to a 'clump' flat



Fig 14. Cactus seedling transplanted into individual pots



Fig 15. Agave seedling ready for transplanting into individual pots

small individual pots (Fig 15). Typically, 2¼ inch (5.7 cm) diameter pots are used for this purpose.

Small amounts of condensation that may form on the plastic wrap are not harmful to germination. The seed should germinate in two to three weeks depending on the species (Fig. 12). After germination, gradually reduce the humidity in the seed container by lifting the sides the plastic wrap. After a period of a few days, remove the plastic cover and carefully monitor soil moisture.

Once the seed has germinated, proper soil moisture is essential. A mist nozzle attached to a garden hose works well for this purpose. Do not permit the soil to either totally dry out or remain waterlogged. Also, don't flood or soak the seedlings as this may lead to loss of seedlings by displacement or by disease.

When the cactus seedlings are about ½ inch (1.27 cm) in diameter, they can be transplanted into either clumps (Fig 13) in a flat or individual pots. Once they reach 1 inch (2.54 cm) in diameter they may be separated and potted individually (Fig 14).

Agave seedlings are easier to handle and less subject to seedling diseases than cactus. Once they develop two or three true leaves, they can be transplanted into

## Maintenance

### Fertilizer

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After the seedlings have grown to ½ inch (1.3 cm) or larger in size, they may be fertilized using a weak (half-strength) solution of a soluble fertilizer. This can be done once weekly and should be sufficient to keep the plants growing and satisfy their nutritional requirements. General purpose 20-20-20 (N-P-K) soluble fertilizer may be used.

### Light

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As the seedlings get larger, light intensity should be increased to where they receive early morning sun or filtered light under a thinly foliated tree or under 50% shade cloth. Remember, these are young immature plants that do not have thick cuticles and other mechanisms to deal with high light intensity. If the plants start to grow irregularly and in particular, if columnar varieties begin to elongate, then they should be given more light. Yellowing on the side of the plant facing the light source indicates too much light.

### Moisture

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Although cacti and agave are drought tolerant low-water use plants, they do respond to periodic watering. When nighttime temperatures are above 60°F (16°C), watering once a week may be necessary. Always check for moisture in the root zone before watering. Periodic drying out of the soil for short periods of time is not detrimental.

## For more information

Agaves, Yuccas and Related Plants – A Gardener’s Guide, Mary and Gary Irish. Timber Press, Portland, Oregon, 2000. Or: [www.timberpress.com](http://www.timberpress.com)

Plant Propagation, Principles and Practices, (7th edition), Hudson T. Hartmann, Dale E. Kester Fred Davies, Jr. and Fred Geneve. Prentice-Hall, Englewood Cliffs, N. J.

University of Arizona Cooperative Extension Bulletins:

Agaves in the Garden (PowerPoint), 80 slides, University of Arizona College of Agriculture and Life Sciences, Tucson, Arizona, 85721

Problems and Pests of Agave, Aloe, Cactus and Yucca. Bulletin Az1399, University of Arizona College of Agriculture and Life Sciences, Tucson, Arizona, 85721

Visit this website for more gardening information:

[cals.arizona.edu/gardening](http://cals.arizona.edu/gardening) or Cooperative Extension publications at: [cals.arizoan.edu/pubs](http://cals.arizoan.edu/pubs)

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**THE UNIVERSITY OF ARIZONA**  
**COLLEGE OF AGRICULTURE AND LIFE SCIENCES**  
**TUCSON, ARIZONA 85721**

**JACK KELLY**  
*Commercial Horticulture Agent, Pima County Cooperative Extension*

**CONTACT:**  
**JACK KELLY**  
[jackelly@ag.arizona.edu](mailto:jackelly@ag.arizona.edu)

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