

# The Double-Cut Technique for Grafting Cacti to *Trichocereus pachanoi* Rootstock

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We have several main goals in grafting cacti. One is to produce a larger number of robust offsets in a short time. Grafting allows us to vegetatively propagate rare or difficult plants much faster than would ordinarily be possible. Grafted plants with many offsets are often quite floriferous. The basic principles for grafting cacti are much the same as for grafting fruit trees. As in any plant grafting, a receiving plant, the rootstock, has its vascular tissue matched to another plant, the scion, placed above it. The two plants are held firmly together by various means until the vascular tissues grow together and join the two plants. In the case of fruit trees, various kinds of apples may be grafted onto an apple tree, or an edible pistachio may be grafted onto a wild pistachio rootstock. However, in cacti grafts, the cacti are not grafted onto closely related rootstock. The scion is often a round clustering plant and the rootstock a columnar type which is not even in the same part of the Cactaceae family, let alone in the same genus.

In some climates with high humidities and precipitation, the only way in which some difficult cacti can be grown is by grafting. On their own roots the cacti would die because their roots could not tolerate the moisture. When grafted to a rootstock which tolerates moisture, the plants often thrive. We sometimes graft cacti which would otherwise require special attention for the ease of cultivation. For example, *Gymnocalycium mihanovichii* var. *federickii* must be maintained as grafts or they die. They occur in bright colors (red, yellow, orange) and contain very little if any chlorophyll. As a result of grafting, they can manufacture their own food. They become virtual parasites on the rootstock.

When set up properly, it takes about 45 seconds to do one graft from start to finish. No time should be lost in applying the scion to the rootstock or the cut surfaces will dry out and the graft will be rejected. Many successful methods have been developed. I utilize a double cut method for grafting onto *Trichocereus pachanoi* rootstock. This method is particularly suited to dry, hot climates. (Grafting is commonly performed in southern California, Japan and Europe under greenhouse conditions and the dry air is not a factor.)

First you need a prepared working area, wiped down with 10% bleach solution. Mother plants, rootstock and a clean sharp knife, also sterilized with 10% bleach should be ready. For the rootstock I use unrooted tip cuts of the San Pedro Cactus, *Trichocereus pachanoi*, for ease in handling. The understock cuttings are rooted after the grafting is done. The *Trichocereus* will eventually take up water and nutrients for the scion above. In this case the scion used is *Sulcorebutia rauschii*. Unrooted rootstock can only be used with a succulent plant such as a cactus which has an adequate supply

of moisture and nutrients in storage to carry both itself and a scion through a period of several weeks until adventitious rooting of the understock occurs.

Unrooted understock is easier to handle and manipulate. Cuttings of the *Trichocereus pachanoi* of an appropriate length should be taken a week before grafting and laid in a shady well-ventilated area so the cut can callous over. This prevents damage to the bottom of the rootstock when rubber bands are applied to hold rootstock and scion firmly together. Length of cutting is primarily determined by the size and softness of the intended scion. For softer, smaller scions, shorter understocks should be used so that rubber bands do not exert as much pressure.

*Trichocereus pachanoi* was chosen as the rootstock for several reasons. It doesn't deteriorate as quickly as other species do when used as a rootstock and it is a strong, robust grower which will hold and nourish a scion of large diameter. Also, it has almost insignificant spines which allow easy handling of the cactus without prior treatment. *T. pachanoi* rootstock can be grown under nursery conditions rather than in a greenhouse which keeps costs down. *T. spachianus* is the next most frequently used rootstock. This species has formidable spines that have to be burned off before it can be used for grafting. It also tends to develop brown patches on the stem which obscure the chlorophyll-bearing tissues and lessen the rootstock life.

In my experience, the rootstock eventually dies. Sooner or later the top plant seems to "burn out" the bottom plant and regrafting of the scion is necessary. *T. pachanoi* lasts longer for me than other kinds of cacti. It is good to have several kinds of rootstock available so that different sized scions can be matched to rootstocks of similar diameter. Other species used as rootstock are *Myrtillocactus geometrizans*, *Cereus peruvianus* and *Hylocereus undatus* (used to produce the "moon cacti").

The first step in preparing the rootstock to receive the scion is to cut the apical tip from the stem far enough down so that the diameter of the vascular system will match that of the prospective scion. The ridges are beveled. Cutting the upper areoles away eliminates the buds which might have eventually allowed offsets to form on the rootstock so close to the scion that the pressure could push the scion away allowing it to break off. The lower areoles of the rootstock may form offsets eventually, but these can be easily spotted and removed as they form. The knife should be sterilized after every twelve grafts, unless brownish discolored tissue is encountered in either scion or rootstock. Then the knife is sterilized after each cut until healthy tissue is reached. If only a small amount of grafting is to be done, the knife can be sterilized between each graft. The knife should be extra sharp for best results. I use a stainless steel paring knife which is sharpened to a fine edge.

Next, a second very thin cut is made just below the original cut through the diameter of the stem. This piece, like a slice of dill pickle, remains on top of the stem, covering the surface while the scion is being prepared. This double cut technique prevents dehydration of tissues. The key secret to successful grafting is preventing dehydration by protecting the cut surface from the dry air, even for a few seconds. Do not allow either surface to dry out at all. The cuts must be perfectly smooth and flat – no ripples. Both



Under desert conditions of low humidity, the double cut technique is a key to successful grafting.



After a fresh cut has been made on the scion, the two plants are brought together and the slice from the double cut removed.



Scion in place on the rootstock and centered so the vascular tissues will match.



Two rubber bands are used in plants at right angles to each other to provide firm and even pressure.

rootstock and scion should be actively growing when the graft is made. When preparing the scion, try to make the cut which severs the offset from the mother plant just as straight and flat as possible so the offset can be placed directly on the rootstock. If trimming needs to be done, place the offset on the table in front of you for good visibility and use thin cuts. Then raise the offset above the rootstock, the latter having been set upright on its flat base. Remove the cut slice and place the scion where the slice had been, preferably as one operation.

With experience, if the correct size scion is matched to the correct size understock and centered by visual inspection from above, there should be sufficient vascular overlap for successful grafting to occur. It is less desirable to spend time aligning tissues because every instant allows the surfaces to dry out and the probability of an unsuccessful graft is much higher. After the scion is in place, I stretch a pair of rubber bands in two perpendicular planes around both scion and rootstock. When viewed from the top, the rubber bands should divide the plants into four equal quarters. This ensures that pressure will be evenly applied on all sides. Then the grafted plants should be set aside in a well-lit location and observed after two weeks to determine whether the graft has taken. The rubber bands can be removed after one week. By this time, if the grafting has been successful, the scion should begin to become more turgid. The rootstock can then be placed into soil mix to form adventitious roots.

Stand each stem in a pot which just comfortably receives its basal diameter with a little room to spare on all sides. Potting soil should be placed to a depth so that the stem rests on it without becoming imbalanced in the pot. Then put a layer of chat (medium larger than sand but smaller than pea gravel) between the stem and the soil and fill between the stem and pot sides with chat. This ensures good drainage all around the rootstock and keeps it from staying too wet. Roots should extend well into the soil after four or five weeks have gone by. The chat is larger than sand but smaller than pea gravel.

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## Cool Plants for Hot Gardens

**Greg Starr**

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Greg Starr, a Tucson AZ nursery owner and master gardener, offers extensive information on 200 low water use plant species in his new book *Cool Plants for Hot Gardens*. Each plant description begins with field notes, discussing the plants' origins. Appearance, ornamental features, maintenance, climate requirements, landscape applications, precautions and tips for identification are included. In the list of characteristics Starr has cleverly integrated symbols for butterfly attractors, hummingbird attractors, plants for containers and plants for pool areas. The plant description is complete but not so loaded down with botanical terms that your eyes glaze over. The culture/maintenance section, tells the gardener just where to place the plant and how and when to care for it. Another great section is the landscape application section advising how to use this plant to its best advantage and what to plant with it.

Throughout the book but particularly in the introduction are gems of advice stated in Greg's humorous way. "Find healthy gardens you like in your area and shamelessly copy favorite elements" is one piece of advice. There is a warning not to skip the soil section and go straight to the pretty plant pictures as well as a suggestion to consult your local extension agent and your therapist if your plants are struggling. This is an essential reference for desert plant lovers interested in conservation of resources and also maintaining a species rich environment.

