

Cactus Grafting Methods[♦]

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It is with deep regret that the editors convey the unexpected passing of Marlin Huffman in November 2002. He was indeed a very imaginative and creative cactus enthusiast as evidenced by this manuscript on grafting. As all the details of this manuscript were never resolved, Peter Felker, as scientific editor, has used his best judgment to clarify the details.

Often in cactus genetic improvement, hybridization, and clonal selection programs, the researcher needs a more rapid method to prove or disprove the merits of a fruiting or nopalito clone.

To speed the evaluation process for fruit production and to adapt certain clones to local conditions, we have started to graft untested genetic material onto mature plants in the ground.

Opuntia clones typically used for fruit production do not fare well in our wet lowland subtropical area of southern Florida due to nematodes and low tolerance of water on the roots. Thus, we have grafted *Opuntia* fruiting clones' scions onto *Nopalea* sp. rootstock, which has better tolerance of excessive water and nematodes.

In making intergeneric grafts, we find that mature cladodes do best and respond more rapidly. The cladodes of the rootstock and scion portion should be as close to the same size as possible.

Several methods can be used successfully. The cutting tool (knife) should be sterilized with alcohol between cuts. As shown in Figure 1, the first step is to remove a 5-cm to 7-cm piece of the rootstock terminal cladode and to cut an equal-sized piece of the tip of the donor cladode to be used as the scion.

The graft cut tip can be attached to the rootstock using wooden toothpicks punched through the graft and into the rootstock. Sometimes, this is sufficient for a successful match, but usually this results in less than 50% success.

To insure a 95% to 100% success, after attaching the graft to the rootstock with toothpicks, we use clear 7.5-cm-wide box tape to seal out air and give greater stability to the attached graft (Figure 2). The tape should be left on for at least 60 days, although the graft probably will sprout a new cladode in 60 days. However, now we never remove the tape because removing the tape sometimes causes the graft union to fracture and die. In time, sun and plant acids deteriorate the tape. We also have used gray duct tape, but clear tape allows sunlight through and helps reduce bacterial or fungus contamination at the graft union.

Another method we have used successfully is to cut a pie-shaped wedge from a terminal-cladode tip of the rootstock and insert a like wedge of the graft. Also, it is possible to match the rootstock in almost every way that conventional plants are grafted.

Also, a deep, clean cut can be made on the desired rootstock and, very simply, a piece of graft can be inserted and sealed with grafting wax. Figure 3 shows an example of the new shoots that have emerged from the graft union. Plane and horizontal views of spineless *O. ficus-indica* grafted onto *O. cochinillifera* are illustrated in Figures 4 and 5, and an example of spiny *O. ficus-indica* graft is shown in Figure 6.

[♦] Received 7 February 2003

Opuntia species and *Nopalea* species are compatible. We have successfully grafted interchangeably some 30 genera in our collection. For example, the following species have been grafted successfully to *Nopalea* both as the rootstock and the scion.

Trichocereus spachianus
Trichocereus macrogonus
Trichocereus pachanol

Hylocereus trigonus
Hylocereus undatus

Selenicereus grandiflorus

Opuntia bergeriana

Opuntia ficus-indica

Nopalea sp.

In my experiments, *Opuntia bergeriana*, *Opuntia ficus-indica*, and *Nopalea* sp. produced flowers and fruit after grafting. With this method of putting experimental clones, selected clones, and crosses on mature plants, we can get growth and flowering much sooner than growing the clone from a cladode.

It has been my experience with all these graft combinations, that the graft would take quicker and with a higher percentage of success when the rootstock was uprooted and placed in the soil shortly after the graft procedure. I never tried to delay putting the uprooted plant/graft in the soil 10 days to 30 days after grafting, but this would be an interesting experiment.



Figure 1. Small wedge of thornless *O. ficus-indica* grafted onto rootstock of *O. cochinillifera* Accession Texas A&M Kingsville 1269, which is Brazilian forage cultivar Miuda



Figure 2. Example of Clear Tape Used to Keep the Scion Securely in Place on the Rootstock



Figure 3. Example of Newly Resprouted Shoots of *O. ficus-indica* on *O. cochinillifera* Rootstock



Figure 4. Plane View of Thornless *O. ficus-indica* Grafted on *O. cochinillifera*



Figure 5. Lateral View of Thornless *O. ficus-indica* grafted on *O. cochinillifera*



Figure 6. Example of Thorny *O. ficus-indica* Grafted on *O. cochinillifera*

