Grafting Deciduous Plants: Before and Aftercare©

Brian L. Upchurch
Highland Creek Nursery, 269 Drake Farm Road, Fletcher, North Carolina 28732

INTRODUCTION

Discussions about grafting ornamental plants often concern only the techniques or the mechanics of the grafting process. The focus usually involves the type of graft used or perhaps the materials used. The grafting process itself cannot be overlooked or minimized — it is essential in every aspect to the success of the graft. Other equally important factors cannot be ignored. The informed selection of the proper rootstock, the preparation of the rootstock prior to grafting, the collection and care of scion material, and the aftercare of the completed graft are also extremely critical to the success of the grafter. All components of the grafting equation must be addressed to ensure the end result will be successful. In this paper, I wish to place the emphasis on the steps leading up to grafting and the aftercare of the graft. The focus here will also be on winter or dormant bench grafting.

ROOTSTOCK

The first concern in the grafting process is the rootstock or understock. First and foremost, the rootstock and scion must be compatible. If they are not compatible, the graft union will fail, if not immediately then at some point early in the plant's life. Even when they are compatible, some choices are better than others. The wrong rootstock may tend to sucker, outgrow, or undergrow the scion. This can lead to both aesthetic and functional long-term problems with the plant. It is critical to choose the best possible rootstock, and choosing the proper rootstock will come from both experience and communicating with other grafters.

The rootstock must also be vigorous and healthy to ensure grafting success. I have found that an established rootstock will produce appreciably better results than those that have been bare-rooted or transplanted just prior to grafting. In my nursery, I pot-up seedlings in February or March prior to grafting them late in the same year or, more likely, the first of the following year. The seedlings may be bare-root or small plugs. With experience, I have learned what size to order from my seedling vendors to reach the optimum size during the growing season for subsequent grafting. For example, a 1-year-old, 0.3-cm ($^1/_8$-inch) caliper *Acer palmatum* seedling in a small plug will grow during the season to 0.6–1.0-cm ($^1/_4$–$^3/_8$-inch) caliper or better for grafting the following winter.

Seedlings are usually potted into 7.3 × 7.3 × 14 cm (2-$^7/_8$ × 2-$^7/_8$ × 5-$^1/_2$ inch) Anderson tree-bands. This gives me the best use of space during the growing season in the nursery and then in the propagation house during the grafting season. It is also a comfortable size container to hold and work with while grafting each plant. Occasionally, I use the larger 9.2 × 9.2 × 15.2 cm (3-$^5/_8$ × 3-$^5/_8$ × 6 inch) Anderson pot or a trade gallon for more aggressive rootstocks such as *Ulmus alata* and *Nyssa sylvatica* or those with heavy caliper such as *Aesculus species* or *Magnolia kobus*.

The potting mix is essentially the same mix I use throughout the nursery for most crops, grafted or otherwise. It consists primarily of composted pine bark. This could easily vary depending on the location of the nursery, available substrates, and the

needs of the plant in question. The mix should be based on the needs of the rootstock with regards to moisture retention, drainage, and other physical properties important to plant growth. No changes are necessary simply because the plant will be used as a rootstock rather than a finished plant.

I pot up the rootstock in March and place them in a cold frame where they will reside for 8–9 months. The cold frame is initially covered with white poly for overwintering, although this may not be necessary depending on location and plant variety. Much of my rootstock comes from the Pacific Northwest, and it tends to be further ahead with regards to breaking dormancy than comparable plants in my Zone 6 location. The covered cold frame allows me to mitigate late freezes, frosts, and wind on the new seedlings. The cold frame will be uncovered along with the other cold frames in the nursery in early May, once the threat of frost has passed. I then cover most of the rootstocks with 30%–40% shade for the remainder of the active growing season. I believe that some shade reduces stress on the young plants. It also provides a physical barrier against some insects (Japanese beetles) and hail and reduces wind exposure.

The rootstock is basically treated like any other crop in the nursery. It is watered and fertilized based on the requirements of the plant and container size. Pruning is minimal. However, some plants will need to be limbed up to keep the lower trunk clear for later grafting.

One significant concern with plants grown for rootstocks is the use of herbicides. The consensus is that pre-emergent herbicides should be avoided on understock plants. Before I knew better, I used pre-emergent herbicides for a year or so early in my grafting career with no adverse affects that I could readily see. I have since ceased using pre-emergent herbicides on rootstock, but often wonder if this omission is warranted. As a rule, I have few problems with weeds in the tree band crops; probably due to clean bark substrates and the close proximity of the plants in flats and resulting shade. However, with 1-gal crops weeds can be an issue. Rootstocks not grafted the 1st year and held over may have significant weed problems. Weeds, of course, will have the same detrimental effect on rootstock crops as on any other.

In September of the crop year, I remove the shade cloth from the cold frame. As the nights become cooler and October arrives, I reduce irrigation to encourage dormancy.

With somewhat dryer media, shorter days, and cool nights, the plants will shut down for the season. The rootstock is now exposed to the normal temperature fluctuations of fall in the southeast. By early November we have had several frosts, and the days are significantly cooler as well. I then began working to clean up the rootstock as needed. Any weeds present are removed as well as leaf litter.

Around the first of December, I begin to move the rootstock into the propagation houses. I try to spread this task out over the entire month of December. When I begin grafting at the end of December to the first of January, the first rootstock brought in will have been in the prop house 3 to 4 weeks. The last of the rootstock brought in towards the end of December will be grafted in February. The goal is to graft plants that have been in the propagation house environment 3 to 5 weeks prior to grafting. I have made exceptions to this if the weather in December is exceptionally cold for more than a day or so. In this case, I will move all of the rootstock into the heated propagation house.

The environment in the propagation house is very important to the success of winter grafting. I keep the thermostat set at 2–3 °C (36–38 °F) to maintain tempera-

tures above freezing at night. The ventilation fan is set to run when the daytime temperatures in the propagation houses reach roughly 16–18 °C (60–65 °F). No shade is used during this period on the propagation houses. Very importantly, the rootstock is not irrigated at all during the time it is in the propagation houses prior to and for sometime after grafting. This drying out process is especially important on species that tend to "bleed" when cut for grafting. *Acer palmatum* is particularly prone to this. Too much bleeding at the graft wound can "drown" the graft union and may cause the graft to fail.

Given that there is no foliage present at this time and the exhaust fans run less due to cooler temperatures, the rootstock will take 3 to 4 weeks to dry. "How dry" is often a question. The answer comes with experience. I want the rootstock to be free of any excess water and feel light when lifting up the pots, but not so dry that the bark media cannot be re-hydrated. The upper portion of the plant itself should remain green and pliable without showing signs of dehydration or hardening wood. After 3 to 4 weeks in the propagation house, new roots will begin to grow. This is the optimum time to graft.

SCIONS

The next process in grafting is collecting scion material. The stock plants should be healthy and vigorous. Scion material collected from older plants in landscapes or arboreta will often be inferior to those collected from well-maintained stock plants. Poor scion material may result in a failed graft or perhaps a graft that is alive but simply doesn't thrive. It may or may not recover. Scions should be cut from the most recent season's growth; the larger the material, the better. This juvenile growth will offer the best results. Scions should be collected from the most recent season's flush. Larger scion material will produce a much heavier flush of new growth on the fresh graft. The larger scion will also accommodate a larger rootstock, resulting in a heavier flush.

The scions should be dormant. This will enable the graft union to heal before the scion breaks dormancy and begins to leaf out. If the scion material breaks dormancy before the union has healed, the scion will not have nutrients and moisture from the root system to sustain the emerging foliage.

Scions should be cut from stock plants when the temperature is above freezing. It should not be allowed to dry out. Scion material can be stored for several weeks if necessary in a cooler. The primary concern is that the wood does not dry out. Care must be taken to keep scions damp, but not too wet as to cause rot and/or mold problems. It is best to collect scion material as needed, but more often than not it is necessary to store it for some length of time. The sooner it can be grafted, the better. I will often treat the scions with a fungicide and horticultural oil, especially if they have been sent to me or collected from an unknown or dubious source.

One of the most common problems I encounter with scions sent to me from plant hobbyists, arboreta, and gardeners is poor scion material. Scions from older plants tend to be thin and inferior to those collected from well-maintained stock plants. Poor scion material will always affect the quality of the graft, if it is successful at all. In addition, the accuracy of the true cultivar name is often in doubt, especially from nonprofessional sources. Keep this in mind until the identity can be made with certainty as the plant grows through a season or so. It is best to maintain your own stock plants to ensure the quality and identity of your grafts.

THE GRAFT

The intent of this paper is to explain the steps leading up to grafting and then the aftercare of the completed graft, rather than the actual techniques of grafting per se. The type of graft and materials used will depend on the individual's preferences and skill, as well as the type of plant to be grafted.

AFTERCARE

When the actual graft is completed; the plants are kept in the propagation house. Depending on when the grafts were completed and the plant type, the union will take anywhere from 3 to 6 weeks to heal. Early January grafts will take longer than those completed in late February. With longer days and relatively warmer temperatures in the propagation house, the scions will begin to grow.

As the buds begin to swell, the grafts are watered well. This will likely take several irrigation cycles to get the media moistened properly. Once the media is well moistened, subsequent irrigation is applied as needed. I then apply a controlled-release fertilizer (3 to 4 month) at ½ the normal rate. This will feed the graft without pushing them too quickly. They will be fertilized again when potted up later.

The propagator will need to watch for fungal problems, aphids, and slugs during the period between bud swell and initial watering and the time the grafts are moved out of the propagation house. The grafts in the propagation house will generally leaf out earlier than similar plants in cold frames or in the landscape, so care must be taken to avoid spring frosts. Heat and/or power failure at this time can be devastating.

At this time, I spread out the grafted plants as much as possible within the confines of the propagation house. I also remove any suckers that are growing below the graft and any dead plants. Removing suckers will allow for more growth in the scion and also improve air circulation.

Once the new flush has hardened off and frost is no longer an issue, the grafts are ready to be removed from the propagation house. At my Zone 6 location in western North Carolina, this is around the 1st or 2nd week of May. The grafts are ready to either be shifted up or shipped to your customers to continue growing for the remainder of the season.

CONCLUSION

The mechanics or techniques of grafting (a sharp knife; a clean, even cut; the right type of graft; and a good, tight wrap) woody ornamental plants are essential for grafting success. Equally important is the before and aftercare. The proper rootstock, proper preparation of the rootstock prior to grafting, quality scion material, and the proper aftercare of the completed graft will contribute significantly to the success of the grafting process. To be successful, the propagator must understand each step in the process of grafting. Each step is like a link in a chain. If there are problems in one step of the process, the "weak link" may cause the process or chain to fail. However, if the propagator is diligent with each step, successful grafting will be the result.