Propagation of Difficult-to-Root Shade Trees: *Parrotia* and *Carpinus*©

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INTRODUCTION

Parrotia persica 'Inge's Ruby Vase' and *Carpinus betulus* 'Fastigiata' are both upright plants with small leaves and good pest resistance, making them good street trees for urban areas. With the ongoing problems in North America such as emerald ash borer and *Acer platanoides* cultivars joining the invasive species list in New England and eastern Canada, the need for other species or taxa to take over is increasing. Grafting compatibility is always a consideration when dealing with large, mature specimens in the urban setting. Putting these two types of trees plus other difficult-to-root taxa onto their own roots can be very challenging.

Specimen Trees Wholesale Nurseries Ltd. is located in Pitt Meadows, part of the greater Vancouver area in southwestern British Columbia. The nursery is compromised of 480 acres; 20 acres of containers, 6 acres under polyethylene greenhouses, and 450 acres of field-grown conifer and deciduous trees and shrubs.

The greatest hurdle we have overcome is the successful propagation of hard-to-root deciduous trees making them a viable crop for our business. *Parrotia persica* and cultivars of *C. betulus* 'Fastigiata' comprise about 10% of our production.

MATERIALS AND METHODS

Cutting Stock Parameters. Without exception, juvenile plants produce the best cutting material. We have found that cuttings from 3- to 4-year-old trees produce the most viable cutting material. The timing of taking the cuttings is important. In most years mid-July is the best time. The cutting wood should be actively growing. Each piece of cutting material should be around 24 inches long. We harvest in the morning and bring them into the propagation house where they are kept under micro-spinners until processed. Any wilting or stressing at this stage is very detrimental to later rooting percentage and over-wintering longevity.

Processing of Cuttings. Cuttings are made from the current year's growth that has matured. Tip cuttings are typically not used, because material is usually too soft. Soft material is susceptible to bruising in handling, burning at point of hormone contact, poor bud maturity, and leaf scald under misting.

Cuttings are usually 6 to 9 nodes in length with the basal 2 to 3 leaves stripped off. Cuttings are not wounded as this leads to an unbalanced root system when older. We have tried some of the newer rooting hormones such as Gro-root Xtra, but still fall back on the brand Stimroot. This material is an ethanol-based IBA solution. Through trial and error a concentration of 5000 ppm has been found to be the best on *Carpinus* while a concentration of 8000 ppm is needed for *Parrotia*, *Cercidiphyllum*, *Acer*, and many others. The basal end of the cutting is dipped to a depth of about 1/4 inch.

The basal cut is always made just below a bud, the closer to the bud the better. Longer stem material left below the bud nearly always dies, usually causing total necrosis of the cutting.

Rooting Substrate. In the case of both *Parrotia* and *C. betulus* 'Fastigiata' we have had the best success with a product made by Oasis. We use the $1^{1}/_{4}$-inch square cubes, which come in a form like a large bar of chocolate. This product comes with pre-drilled holes; however the width of the hole is usually too great to allow the cuttings to have total contact with the material. Cuttings when stuck are placed slightly away from the manufacturer's hole.

Plug sheets are placed in flats and pre-soaked before use. Pre-soaking is imperative to stop the drying out of the cuttings before the misting system can soak the cubes. As long as the cuttings are placed in the same location in the cubes, even spacing is achieved. For larger-leaved species and taxa a larger cube is used.

There are two important features of these cubes. First, they are sterile, and second, they hold the cutting securely with no root disturbance.

Once the plug trays are filled with cuttings they are placed on the mist benches. A 1% Captan solution is applied at this time. The cuttings receive a bottom heat temperature of 75 °F (25 °C). Misting cycles are set at 10 sec on and 5 min off. Even though the cuttings are sitting in a totally moist environment rooting is fast. *Acer rubrum* cultivars are on and off the benches in 3 weeks. Full rooting of both *C. betulus* 'Fastigiata' and *Parrotia* is usually around 10 weeks, as is *Cercidiphyllum* and *Magnolia* cuttings.

Winter Husbandry. As the days start to shorten, the misting cycle is cut back. Leaf drop is a constant clean up job, but very important in keeping things clean. The early-to-root species such as the *A. rubrum* and *Prunus* cultivars are long ago off the benches and transplanted.

Carpinus, *Cercidiphyllum*, *Magnolia*, and *Parrotia* are handled differently. Even though rooting is strong, transplanting at this time will create very large winter losses. We have found that keeping them on the bottom heat until spring keeps the rooting and transplant percentages very high.

By the first of November all leaves are removed. Rooting percentages are high, 85% or better. Even though the tops are dormant, the bottom heat continues to promote root growth.

The misting frequency is decreased every third day until there's only one 15-min cycle at mid-day to prevent the plugs from drying out. The root zone temperature is dropped to 55 °F (13 °C). The propagation house area is not heated; as a result the tops of the cuttings are kept cool.

Bud Break. Around the first week in March the buds start to swell. The rooted plugs are removed from the mist benches and put into a hardening-off area. The area is not heated, which allows the root system to harden and the buds to break slowly, making the flush less susceptible to fungal attacks.

The rooted plugs sit in the hardening-off area for about 1 month, then are transplanted into a mix of peat and green sawdust mix (6 : 4, v/v), Nutricote 17N–7P–9K mini-prill and micronutrients.

The transplanting is done easily as the flats of Oasis cubes are broken apart. If rooting is not evident then the cutting and cube is discarded. Grading is important because a uniform root system is desired. *Parrotia*, *Carpinus*, *Cercidiphyllum*, and

especially *Magnolia*, do not like root disturbance at time of transplanting and are slow to recover. The use of the Oasis cube totally alleviates this problem since the complete package is transplanted.

Things to Touch On. Since we are a caliper tree grower, the development of the root system is hugely important. Early rooting techniques using oasis cubes and the possibility of the coconut fiber plugs are the beginning of the process. The use of the Anderson pot, whether it is the bands pot or the band pot, is important to developing a downward root system at time of transplanting. A circular root system becomes a liability to the tree as it grows older.

CONCLUSION

I would like to say in closing that the key to successful propagating of difficult-to-root deciduous trees is in how far you are willing to stretch and bend your methodology. There is no one best method. It has taken Specimen Trees Wholesale Nurseries Ltd. 15 years to get to this stage, and yet we still modify our practices.