

a lot faster than poly though.

ED SCHULTZ: But you could correct it by increasing the speed of the water going through.

CONIFER AND MAGNOLIA GRAFTING

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The "upright" junipers are some of the most sought after plants we grow at Monrovia Nursery. The high demand for these plants is in part maintained by the difficulty in producing them in large quantities. Although some can be successfully and economically grown from cuttings, many others must be propagated by grafting. The types of junipers we graft are mostly cultivars of *Juniperus scopulorum*, some of which are: 'Cologreen', 'Gray Gleam,' 'Welchii,' 'Tolleson's Weeping' and 'Wichita Blue.' Except for the use of different understocks, the methods for grafting our other conifers are the same as those used for the junipers. Since the grafting of our *Magnolia grandiflora* types coincides closely with that of our conifers, their production will also be described in this paper. The cultivars of magnolia we are now grafting are: 'Majestic Beauty,' 'St. Mary' and a USDA introduction called 'Little Gem.'

JUNIPERS

Understock: For good results, it is important to start with a good, vigorously growing understock. There are three we commonly use: *Juniperus chinensis* 'Hetzii', *J. virginiana*, and *J. virginiana* 'Skyrocket.' We like to use 'Skyrocket' because it is less susceptible to the various fungal diseases which can infect *J. virginiana*. Also, 'Skyrocket' produces a straighter, more graftable understock than 'Hetzii.'

The 'Skyrocket' are rooted as cuttings and then are potted into liners. They will be ready to graft approximately two years from the time the cutting was made. About three weeks prior to grafting we start preparing the understock. This preparation consists of: 1) sorting for size, (5 to 7 mm in diameter is desired), 2) pruning up the sides in order to clean the working area for the graft, (an area of 7 to 10 cm starting at soil level and extending upward), and 3) pruning the tops to reduce foliage and create a uniform appearance. This process is started approximately the first week of November. One week prior to grafting, the under-

stock is brought into the greenhouse and watered thoroughly. Within a week they are actively growing and ready for grafting. They are sprayed with Physan disinfectant and allowed to dry prior to grafting. Grafting continues through mid-January.

Scionwood: We have a crew of four who collect the scionwood daily. Most of the wood comes from our 5, 7 and 15 gallon containers. We also get some scionwood from stock plants which are planted throughout the nursery. However, the wood collected from the containers yields better percentage of "take." This is probably due to the fact that the plants in the containers grew more actively during the previous year than the stock plants, thereby yielding scionwood that is more vigorous, has better caliper, and is cleaner.

The scionwood is brought into the greenhouse where it is prepared for the grafters. We use mostly tips which are 12 to 15 cm in length. They must have 4 to 6 cm of brown, partially matured wood at their base. All side growth on the lower 6 cm of the scion is removed to provide a clean area for the grafters to make their cuts. The softer growth on the tip of the scion is also removed. This is done by pulling or tearing rather than cutting because if the tips are cut, it will result in brown necrotic areas. Such areas are more likely to become diseased in the high humidity and temperature they will be exposed to. The scionwood is then washed and disinfected in a solution of 200 ppm Physan, placed in plastic bags, and stored in a cooler at 3° to 5°C (38° to 40°F). We try to use the scionwood within 2 to 3 days. It can, however, be kept quite successfully for as long as one week.

Grafting Technique: The type of graft we use on our conifers is the basic side graft. The understock is the first to be cut. Starting at a point as low as possible on the stem, a longitudinal incision of about 30 to 35 mm is made. The cut ends at a depth of about ¼ the diameter of the stem, therefore leaving a flap. An 80% isopropyl alcohol solution is used to disinfect the knife between cuts.

On the scion, we first make a longitudinal slice of about 30 mm on one side, and then we make a second, slightly shorter, parallel slice on the opposite side. It is important to leave a small strip of undisturbed bark on each side of the scion. The strip of bark on one side should be slightly wider than the other. This wider side is used to match cambium layers with the understock. If the scion is not wide enough to match with the understock on both sides, having the second side of the scion slightly narrower will allow the flap of the understock to close more fully. We also cut a small wedge at the base of the scion to remove the very thin wood which could be more subject to desiccation.

After the scion is properly inserted into the understock, the

graft is wrapped with a budding strip ($\frac{1}{4}$ in. by 4 in.), applying a medium tension. The wrapping begins at the top of the graft and finishes at the bottom with a half-hitch so the strip can be later easily removed. No tar or wax is used.

Grafting Tents: When the graft is completed it is then placed into a "grafting tent." This consists of a raised bench with a plastic quonset-type covering. This tent provides an environment of high humidity and relatively warm temperature for the grafts. The tent is prepared in the following manner: first, the bench top is covered with waxed paper, and then a three inch layer of peat moss (treated with Captan) is placed on the paper. The benches have 3 to 4 in. side walls which prevent spillage of the peat moss. Over the bench is built a small quonset-type structure which supports a poly cover. Under the bench there are hot water pipes which provide warmth for the grafting process. To help reduce foliage fungus problems, we install a small convection tube within the tent. This keeps the air circulating, which helps to prevent water condensation. Thus, we can maintain a warm, high humidity environment while the foliage of the plants and the graft unions themselves are not overly wet.

The method of placing the grafted plants into the tent is regulated closely. The pots are "plunged" into the pre-moistened peat moss, in rows, at about a 60° angle, with the graft unions on the top side. This is done to prevent water from sitting on the graft unions. Any condensation which forms or drips on the grafts quickly runs off due to the angle. Also, with the graft unions on the top side, they get better air circulation and light which helps to prevent disease. The pots are plunged to a depth so that the peat moss holds them at the proper angle, but not so deep as to have the peat in contact with the graft unions.

Prior to placing the grafted plants in the peat moss, the peat is made wet to the run-off point. Also, prior to grafting the understock is thoroughly watered. These steps are important because once the grafted plants are put in the grafting tents, the tents are closed and sealed. Just prior to sealing the tents, the beds of new grafts are sprayed with Benlate as an extra precaution against disease. The tents remain closed for two weeks.

Hardening-off: Within two weeks, as many as 25% of the grafts are ready to be removed from the tents. We watch for new growth on the scions, and when this growth is 5 to 10 mm in length the graft is removed from the tent and hardened off. The majority of the grafts will have been removed within a 5 to 6 week period. After the initial two week period, we start spraying all tents and new grafts on a weekly basis with a fungicide. We normally alternate spraying with Benlate, Dithane Z-78, and Mertec.

When the grafts are removed from the tents they are placed on open benches in the greenhouses. Here they are sprayed with water several times a day to prevent drying. They are kept in the greenhouse under these conditions for an additional two week period, after which they are moved outside to a shaded area. At such time, spraying, or misting, will continue for approximately a month, during which period the frequency of spraying is gradually reduced. During this hardening-off time it is necessary to keep the foliage of the understock cut back to encourage growth of the scion.

Canning: We start to can the new grafts into gallon containers during early to mid-March. Several weeks prior to canning the understock is removed completely. The grafting strip is left to protect the graft during the canning operation but is removed within one month after canning to prevent girdling. By the following December, the plants will be 18 to 24 in. in height.

MAGNOLIAS

Understock: We use one gallon *Magnolia grandiflora* plants, (which take about two years to reach a suitable size), for our understock. Because of the large diameter of the scion (10 to 12 mm), we must use understock of at least equal size. In September or October, all of the one gallon understock is pruned to a height of 24 in. This assures uniformity within the grafting tents later. The understock has usually been staked to help produce a straight stem and working area.

In the first part of November, as soon as there has been some cold weather, we begin to bring the understock to the greenhouse area, where it will be prepared for grafting. The stake, all of the side branches, and most of the leaves will be removed, with only a few leaves remaining at the top. The understock is also sorted for proper size.

The plants are then brought into the greenhouses, watered thoroughly, and placed, can tight, into grafting tents. These tents are nearly the same as those used for the junipers, except they are taller and have only a thin layer of peat on the bottom. The bed of understock is sprayed with Physan and allowed to dry before grafting.

Scionwood: All scionwood is collected daily from trees planted throughout the nursery. The stock plants are watched closely to ensure healthy scionwood production. We use only tips or terminal ends which are cut 20 to 25 cm in length. All foliage is stripped from the scions and they are disinfected in a bath of 200 ppm Physan. They are then placed in plastic bags and stored in a cooler at 3° to 5°C (38° to 40°F), until needed. We try to use all scions within three to four days.

Grafting Technique: The technique for grafting our magnolias is the same as that used for our junipers, except with the magnolias we are dealing with larger scion and understock. The longitudinal cut in the understock will be 5 to 6 cm in length, ending at a point about $\frac{1}{4}$ in diameter of the stem. The cuts on the scion will also be about the same length, but the width of the bark between the cuts must be much thinner (about half the thickness) on one side. As with the junipers, the cambium of the wide side is matched with the cambium of the understock, and unless both sides can be matched, the flap lays over the narrow side. The graft is wrapped from the top down with medium tension. A wide ($\frac{3}{8}$ in. by 8 in.) rubber strip is used, with a half-hitch placed at the bottom.

When we finish grafting a bed, the plants are sprayed with Benlate and the plastic cover is sealed on the tent and remains closed for two weeks.

By the end of two weeks, the first signs of growth on the scions are observed. The terminal buds begin to swell and pop off their caps. Within another week or two, they will start to unfold their first leaves. When the plants have one or two fully opened leaves they are ready to be removed from the tents. We observe the same fungicidal program as with the junipers.

Hardening-off: The magnolias are hardened off in the same manner as the junipers. They are first placed on an open bench within the greenhouse, where they are misted as needed for two weeks. They then are moved outside to a shaded area where the misting continues for an additional month.

Canning: The transplanting of the gallon grafts into five gallon cans is done between March and May. It is best to have all of the plants canned prior to the hot weather. Unlike the junipers, the magnolias are canned with the understock still present. This is done because the foliage of the understock shades and protects the tender new foliage of the scion. Near to August, the understock is removed completely after the scion has had a chance to grow and "toughen up." It is not necessary to remove the rubber strips since their exposure to the sun quickly weakens them and they break off.