Daytime temperature may reach 85°F. We do not shade until it is extremely hot. We mark the cuttings with stakes in front of the first and behind the last plant. We write out the preferred Japanese name on the stakes. We change to metal tags when the plants are moved to the plastic house.

After the grafts have knitted and are growing, a careful check is made daily to determine if the rubber bud strip should be cut to prevent girdling. This is very important as the scions expand tremendously. A constant check is also made for suckers and aphids as they can weaken or destroy a good scion.

The grafts are allowed to remain in the greenhouse until the following fall. Some cultivars have grown in excess of 3 ft. during this period. All grafts are then moved to a plastic house for the winter.

Last year we grafted about 140 cultivars of *Acer palmatum*, plus cultivars of *Acer buergerianum*, *Acer campestre*, *Acer japonicum* and other species and their cultivars.

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PROPAGATION OF SHADE AND FLOWERING TREES BY CUTTINGS AT PLEASANT COVE NURSERY

JAMES WHALEY

Pleasant Cove Nursery
Route 3, Highway 70S
Rock Island, Tennessee 38581

Pleasant Cove Nursery is located in Middle Tennessee where competition is keen. Since our only products are containers and balled-and-burlapped material, our customers are usually retail nurseries and landscape contractors. One of our foremost objectives is to provide our customers with a large selection. With over 140 cultivars of field stock and 100 cultivars of container-grown plants, it has become necessary to propagate many of our plants. In recent years we have expanded our propagation facilities to an annual production of over 500,000 plants. Of these, 125,000 are flowering and shade trees. We are constantly trying new selections of trees that can feasi-

bly be rooted from softwood cuttings. Since this program was instigated, several cultivars, such as flowering dogwood (*Cornus florida*) cultivars; thundercloud purple leaf plum (*Prunus* × *blireiana*); and Yoshino cherry (*Pruus* × *yedoenis*), are produced each year with good success. This past season we had very good results with some of the red maple (*Acer rubrum*) cultivars, and several cultivars of flowering crabapple (*Malus* spp).

Preparation: All cuttings are rooted in ground-bed houses. No bottom heat is used. The rooting medium consists of approximately 60% pine bark, 30% top soil, and 10% sand. The mix is thoroughly tilled about 10 in. deep. It is then sterilized by gassing with methyl bromide at a rate of 1 lb/60 ft^2. Immediately after aeration the house is covered with clear plastic. During rooting we try to maintain a surface temperature between 95° and 100°F. (32° to 35°C). This is accomplished by applying various amounts of white paint and by cutting about five 12-in. diameter holes along the top of the house. Door openings are covered with burlap as a wind barrier and, depending upon the weather, we regulate the temperature by opening and shutting the doors.

From a propagation standpoint we segregate the dogwoods from the other flowering shade trees. Dogwoods are stuck the latter part of July, whereas all others are rooted in late May and early June. Therefore, bed preparation varies. Beds used for early cuttings are leveled and thoroughly watered; 50 lbs of Osmocote (18-6-12) are incorporated into the top 2 in. of the medium in each house at a rate of 1 lb/20 ft^2. It seems the cuttings benefit from added nutrients immediately upon rooting (3).

Dogwoods differ in that they are rooted in 2¼-in. plastic cups. After the bed is tilled, the mix is raked aside and the cups are hand placed in the bed and then filled and packed. This is done before gassing. There is no fertilizer added.

Cuttings: All cuttings are taken from young, vigorous, field-grown plants usually no older than 3 years. They are preferably taken early in the morning before it becomes hot. Cuttings taken in June are tender and very susceptible to heat. As soon as the cuttings are taken, they are placed in a large water vat and covered with Saran cloth. They are transported to the "cutting house" where they are either made or placed in cold storage until preparation. Cuttings are 5 to 8-in. long. About ⅓ are stripped; the remaining leaves are tipped and a slant cut is made at the base of the cutting. They are then washed in a Benlate solution as a disease-preventative treatment, drained, and placed in cold storge. The following morn-

ing all the plants are stuck by the cutting crew. This allows the field crew time enough to gather sufficient cutting material and all sticking is accomplished before the houses become uncomfortably hot. By using this procedure, all cuttings are taken, prepared, and stuck in a 24-hr period.

Early May and June cuttings are taken as soon as new growth is firm enough to stick. When they are taken later in maturity, rooting is not as quick or vigorous. Birch cultivars are an exception. They seem to do just as well taken 2 or 3 weeks later. All cuttings are dipped in a liquid alcohol solution of 10,000 ppm IBA. Under optimum heat, intermittent mist is set for 10 sec. at 10-min. intervals. On extremely hot afternoons it is increased to 10 sec. every 5 min. Likewise, on cool or rainy days the mist is cut back or cut off completely. Rooting usually occurs in 2 to 4 weeks. The plastic is then removed and replaced with 50% Saran. We continue with the intermittent mist for about 2 weeks, slowly cutting back the amount every few days. This prevents any shock or burn that may otherwise occur. The Saran remains for another 2 weeks. After its removal weeds are extracted and an application of Scotts Ornamental Herbicide 1 is applied.

During the growing season Sta-Green (12-6-6) Nursery Special is added 1 lb/30 ft^2 every 6 weeks. Each month a solution of either Benlate, Banrot, or captan is applied as a fungicide treatment, and Subdue is used as a drench at least once to prevent root rot. Late November the houses are covered with clear plastic for overwintering. Enough growth is attained for early transplanting the following spring, usually in February or March, before the plants break dormancy.

The procedure and care for rooting dogwoods is different as follows. Dogwoods are taken in late July and dipped in an alcohol solution of 20,000 ppm IBA. Little, if any, fertilizer is applied before winter. As described in earlier *Proceedings* by Flemer (2) and by Bauer (1), dogwoods are susceptible to winter damage. For protection we harden the young plants by exposing them to 2 or 3 light frosts. Then each of the beds is covered and sealed with a blanket of Microfilm and plastic. The house is also covered with plastic, and gas heaters are installed. These are only used on extremely cold days when the house temperature drops below 20°F (−7°C). In early spring when temperatures begin to moderate, the beds are uncovered and Sta-Green (12-6-6) is applied, as previously described, to promote early growth.

A sufficient root system and some top growth (1) must be established before dogwood can be successfully transplanted. In June the plants are uncupped, dipped in Terra-Sorb and trans-

planted. Young plants should be irrigated when necessary for the first season.

With the advancement of rooting hormones and different propagation techniques, there will be more and more breakthroughs in rooting tree species. As operating costs rise, nurserymen are constantly striving for more resourceful means of production. New ideas and the necessity of lower costs will open many doors for rooting flowering and shade trees.

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LIME AND LIME SOURCES IN CONTAINER NURSERY PRODUCTION

KEITH R. GUTHRIE

O.M. Scott and Sons, Inc.
Marysville, Ohio 43041

The topic of lime and lime sources is one that has confronted nurserymen throughout nursery history, especially since the advent of container production in soilless and bark mixes.

In container production, the standard practice has been to add a certain quantity of lime to the mix, either for pH adjustment, or to supply calcium and magnesium, or for both reasons. There are a number of products available to growers that will fill the need when a lime source is desired (10).

It is my intention to focus on several sources of lime, the merits and disadvantages of each, and also to present some of the findings from an O.M. Scott and Sons research project this past spring.

It is important to know what calcium and magnesium are and what they do for the plant. The element calcium is required for active cell division, formation of cell walls, transport of carbohydrates and amino acids, and formation of roots.

A deficiency of calcium results in a stunted plant and restricted leaves. Some plants show a paleness at the leaf margins and curling leaves. This is most noticeable in broad-leaved plants. Three sources of calcium are: