BILL SNYDER: Are the roots on one side or distributed around the cutting?

THOMAS MARINO: It is variable The older the cutting the more prone the roots are to be on one side.

BRUCE BRIGGS. Did you remove any of the needles when you put the cuttings in? Did you do a leaching experiment for 12-24 hours? In Japan they have obtained a good rooting response with some pines after leaching

THOMAS MARINO: We left the needles intact and, no, we have not tried leaching.

PROPAGATION AND PRODUCTION OF *RHUS TYPHINA* 'LACINIATA', CUTLEAF STAGHORN SUMAC

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The cutleaf staghorn sumac is a very hardy form with bright green leaves, deeply cut foliage and good fall coloration. It is sometimes referred to as fern leafed sumac.

The propagation and growing of this attractive plant is not a very common practice in midwestern nurseries. This creates a good demand and we are always sold out before our season is over. There are only a few nurseries who grow it.

The procedures described are our own methods and derived from a trial and error procedure over a period of more than ten years. We have found it to be a somewhat difficult and inconsistent subject but by using large numbers and being persistent, we have always had a crop of plants for sale.

Growing conditions. It is one deciduous item we can grow and produce to saleable sizes in one season's growth. Our growing season in Southern Minnesota is normally about 115 days with precipitation averages of nearly 30 inches per year.

Our soils are a silt-loam type and very moisture retentive We do not irrigate them or use any herbicide or chemical fertilizers during the growth period. We try to apply cattle manure to our nursery about every other year.

We harvest this crop in early November when they are completely dormant They are taken to the root cellar and stored until we can grade them, usually in December. The plants will grade out into four sizes, from 9-12 inches to 3-4 foot.

Propagation. While grading, we get our root pieces for propagation. Most of the plants have abundant root systems about 2 feet long. From these we take as much root as safely possible without harming the plants for sale. We collect the roots and put them in baskets until we have all we need. Last year we cut fifteen bushels of root pieces. The roots we cut are usually one to two feet long. We then put some sphagnum moss over them and put the baskets of roots in the root cellar where it is cool. The moss should not be wet but only slightly moist. They are kept there until worked into cuttings which is usually during January

At that time they are cut into cuttings about four inches long using sharp snips. The roots are slightly tapered; and it is important to arrange the cuttings with the upper ends all pointing in the same direction. Any side roots are removed at this time for ease in planting.

The cuttings are then tied into bundles of 50 with the lower ends being dipped in rooting powder. We use a 0.3 percent IBA in talc (Hormex 3 or Hormodin 2). The treated cuttings are then packed into boxes or baskets with the tops upward and packed well with slightly moistened sphagnum moss.

While working with the cuttings I have the workers use a heavy hand cream or lotion for protection from the sumac sap.

The boxes are then covered with poly and placed in a cool greenhouse 50 to 60°F under benches and left for about 10 days. While here they get some sap moving and begin to callus. This is about the same procedure we use on *Malus* (apple) bench grafts. After this period they are taken back to the root cellar where they are stored until planting time in May. It is important to protect them from water or freezing. The temperature in the root cellar is 35°F.

We like to remove them from the root cellar several days in advance before going to the field to warm them up before planting.

Field planting. We do our planting in the first part of May when the soil has warmed somewhat. We select a field that was weed free the previous year. The soil is worked well to make planting easier and also destroys any seedling weeds. The cutting boxes are taken to the field and unpacked as they are needed. We use a mechnical transplanter to plant the root cuttings. They are spaced 8 to 9 inches apart and in rows 44 inches apart. The cuttings are set upright with their tops even or slightly above the soil surface. A crew member walks behind the planting machine and straightens any tipped cuttings and also tramps the soil on both sides of the cutting. Some are

not packed well enough with the machine and may dry out if this is not done carefully. After planting is completed they are cultivated very carefully and the soil is loosened to keep from crusting. Usually in about 2 weeks they are cultivated again very slowly and carefully to control moisture At this time it is difficult to see the rows, therefore, stakes are placed in the rows to guide the operator.

Sprouts start to show in about a month after planting. Cutleaf staghorn sumac sprouts very slow and erratically. Some will take as long as 2 months to come up. After most have sprouted we cultivate once with hand scratchers very carefully, this loosens the soil around them and removes any weeds. If a hoe is used it may damage too many as there are still some under the surface.

The sprouted cuttings are very soft and fragile when small. About half of our 1980 crop in one field was lost in a June hail storm just as they were emerging. Because this plant is so fragile, we try to plant it in two fields several miles apart for protection from hail and severe storms.

The cultivation and weeding process is continued until growth is well established and too tall to go over without causing tractor damage. This is usually about mid-August. From then on the plants are left on their own. Most of the one year plants have a single stem or cane. If left for two years they are two and three cane plants but grow so large they are difficult to store and ship.

Harvest and storage procedures. After coloring beautifully in September and October the plants lose their leaves and ripen quickly during the hard frosts of late October. In early November they are dug using the Kelley type side-mounted digger and taken into the root cellar before severe weather arrives They are stored under high humidity at about 35°F until grading time in December. It is important that they are not allowed to get too wet as this will cause mold and bacterial rot.

RESULTS

This I consider to be the most important part of any propagation — the yield of saleable plants. This varies from year to year. It has run from 50 to 90%. This year we harvested over 6,000 plants and our yield was over 76% saleable plants.

OTHERS METHODS OF PROPAGATION

Cutleaf staghorn sumac is not grown from stem cuttings by any commercial nurserymen that I know of. We find root

cuttings a most satisfactory method. This technique should be used on a lot more deciduous plant materials.

REMINISCENCE ABOUT THE PAST

When I attended my first Plant Propagators Meeting it was held in Cleveland and I have only missed a few meetings since. That was twenty years or more ago. There was Case Hoogendorn, Martin Van Hoff, Leslie Hancock, Roy Nordine, Vince Bailey, and many others who became my good friends. And yes, even Bill Snyder was there, but we all looked a little different then.

I believe this is my last meeting. They tell me at the nursery that "I'm being put out to pasture," after having grown and sold plants commercially for over 50 years. Florence and I plan on an active retirement in Cass County, Minnesota, where it is beautiful, green and cool.

PETER DEL TREDICI: What about taking root cuttings early in the spring before growth and planting them out immediately to avoid some of the pretreatments? I grew *Comptonia peregrina* both ways with equal success.

RICHARD CROSS: It probably would be fine but it does not fit our schedule

VOICE: My dad did *Rhus* propagation and he always said it was important to dry them after cutting. Did you say you did that?

RICHARD CROSS: We do not dry them. However, putting them in moss in the greenhouse at 50°F probably does that.

PROPAGATING DWARF CITRUS WITH HYDRONIC RADIANT HEATED BENCHES

DONALD F. DILLON

Four Winds Growers
Fremont, California 94538

At Four Winds we produce over 30 citrus cultivars which are useful to the home gardener for their fruit production, their beauty as an evergreen, and for their flavors and aromas. Cultivars are chosen to ripen at many different times of the year, offering the home owner a great variety in choices.

Our trees are produced by a method called twig-grafting, developed originally by Halma and Frolick at UCLA a good