VOICE: What temperatures do you use for initial seed stratification, post-stratification, and your second stratification?

SHARON DELONG: We use 36° F, but the seeds are soaked first in water at about 60° or 70° F. They are taken out after stratification, dried, and then put back at 36° F.

VOICE: In your hydrogen peroxide test do you leave the seeds in the hydrogen peroxide until the radicles emerge?

SHARON DELONG: Yes, you soak the seeds before you cut the tip off — the tip of the radicle may be cut without damage. The rest of the radicle will elongate. Then the seeds are put back in the hydrogen peroxide in the dark.

MIKE EVANS: Sharon, when would you use the quick, tetrazolium or hydrogen peroxide seed viability test rather than the standard germination test?

SHARON DELONG: When you have thousands of pounds of seeds that look good inside and out, but they will not germinate. You need these other tests to determine viability.

MICHAEL SMITH: Dr. Moore, has any research been done on the possible effects of the PGPR (Plant Growth Promoting Rhizobacteria) bacteria on seed germination — by way of hormones, or breaking down the seed coats, etc. — which might suggest their commercial use of difficult seeds?

LARRY MOORE: If there is, I am not familiar with it. The work was initiated primarily with things like potatoes and then it spread to other plants that would respond, which response was measured by increased mass or yield.

WESTERN REGION QUESTION BOX

Bruce Briggs and Charles Parkerson, Moderators

QUESTION: What time of year is best to take cuttings of Colorado blue spruce?

DICK BUSH: We take current season's growth — one year old growth — taken in February. If they still are not rooted by mid-summer, we put them in a coldframe and they root in the fall.

QUESTION: What is the advantage of a rooted conifer cutting over a grafted conifer?

VERL HOLDEN? A grafted conifer might break off in a strong wind. I would much rather have a conifer on its own roots.

QUESTION: How do you get cutting-grown conifers to grow straight?

VERL HOLDEN: I believe they will naturally grow straight and they are very uniform. Terminal dominance starts earlier with the cuttings, but this can vary with the cultivar.

MICHAEL SMITH: With redwoods and podocarpus, by proper pruning and staking we can easily establish dominance of a leader.

QUESTION: How do you determine the best time to begin budding in fruit trees?

DICK SNYDER: When the bark "slips" well — toward the end of July (in Wenatchee, Washington).

ALLAN ELLIOTT: Another factor is the maturity of the budwood. The buds should be fully matured. If the budwood is too green the bud will not "take". Over-maturity can also be a problem.

QUESTION: What is the best way to defoliate nursery trees in the fall before digging? Does chemical defoliation work?

DICK SNYDER: Chemical defoliation seems to cause some injury. A lot of research has been done on this by Dr. Fenton Larson at Washington State but it still has not been perfected.

CHARLES PARKERSON: Just get a good pair of gloves and start hand-stripping.

QUESTION: When a patented plant is propagated and a variation appears, to whom do the rights belong to the new variant — the original patent holder, or the one who found the variant?

JAMES WILL: The patent licenses for our roses states that — for any patented plants that are mutated by bud sports or by any other mutagenesis, the mutants belong to the original patent holder. But this may vary according to what is stated on the patent license.

QUESTION: Can a fogging system be set up using only half a greenhouse:

MARK MIRMAN: We are installing a Mee fogging system at City College in San Francisco, and they now make a small unit to use in a small sized area. Just block off part of the house with polyethylene.

QUESTION: What is being done in the area of tissue-culture of citrus:

JAMES WILL: It is my understanding that tissue culture in citrus is mainly work with embryos or portions of the seed — as the nucellus — to develop clonal reproduction from the nucellar embryos.

QUESTION: How do you develop a medium in tissue culture to prevent the formation of excess callus — as occurs with maples?

EUGENE BLYTHE: By reducing auxins or cytokinins, or by incorporating activated charcoal. The latter seems to work real well to hold down excess callus in nandina. But we don't work with maple.

DALE KESTER: Too much auxin will cause excess callus formation. Try changing the kind and strength of auxin.

BRUCE BRIGGS: Talking to people in Belgium, they felt that the location of the tissue on the stock plant could have an influence on the amount of callus developing from the explant.

QUESTION: How do you get tissue-cultured Douglas fir trees to grow straight:

STEVE McCULLOCH: Work at Weyerhaeser with Douglas fir from tissue-culture has shown no problems once they are field-planted, even though this tree is known to be plagiotropic — tends to grow out flat. Ninety-nine percent grow straight once they are in the field.

QUESTION: Does a rooted tissue-cultured plant store better than one without the roots:

STEVE McCULLOCH: Yes, they do. The rooted plant is more mature and well developed and will store better.

QUESTION: If you have two seedlings — one with a good root and one with a poor root, then you tissue-culture these, will these differences be maintained in the tissue-cultured plants:

DALE KESTER: I have not made such a comparison but my expectation would be that whatever is the genetic capacity of each seedling, it would be maintained in the tissue-cultured offspring — although exceptions can occur.

BRUCE BRIGGS: With rhododendrons, 'Pink Pearl' has a poor root system from cuttings and poor roots from tissue culture.

QUESTION: What are the procedures for seed propagation of madrone (*Arbutus menziesii*)?

MICHAEL SMITH: There is no problem in getting the seeds to sprout. Gather the berries in November, mash and allow to ferment so as to extract the seeds — allow for flotation of the pulp. Once planted, the seedlings appear in about 2 weeks. The big problem is avoiding damping-off. Put Truban or other terrazole powders in the seeding mix. Keep seedlings growing strongly, avoid becoming pot-bound. Fertilize and

treat as any other nursery crop. Madrone tends to fail in the landscape, however, after planting. Perhaps it is the lack of a mycorrhizal fungus that they need.

QUESTION: How do you propagate smoke tree (*Cotinus coggygria*) by softwood cuttings:

PHILIP McMILLAN-BROWSE: It propagates relatively easily by softwood cuttings. Prune the stock plants hard in the winter. After a flush of spring growth, take the softwood cuttings and they will root under mist fairly well. The closer the stock plants are cut back to the ground the easier the cuttings will root.

QUESTION: Has anyone tried super-high, 10 to 30 thousand ppm, concentrations of IBA on hard-to-root woody plants?

VOICE: *Photina* × *fraseri*, very softwood cuttings, rooted well with IBA at 10,000 ppm. at Monrovia Nursery. Cuttings are taken just as the new growth flushes — in the bright red growth stage.

QUESTION: What is the best way to propagate Leyland cypress (× *Cupressocyparis leylandii*)?

PHILIP McMILLAN-BROWSE: Take cuttings only from stock plants less that 10 years old. Sub-terminal leader cuttings are best to take. The base of the cutting should be about where the brown scales start, at the beginning of the hard wood. February, June, and October have been the peak times for taking cuttings in Britain. Hormone doesn't seem to help. We have been getting almost 100% rooting.

QUESTION: What are the most successful techniques for propagating *Rosa rugosa* cultivars?

JAMES WILL: A shade house with mist propagation may give the best results with cuttings. Field-stuck cuttings give only 30 to 40% success for us at Armstrongs.

JIM McCONNELL: We generally have good success with softwood cuttings under mist but sometimes certain plants never seem to harden up and you cannot prevent rotting before the roots come out.

QUESTION: What percent hydrogen peroxide is used in this seed test:

VOICE: Take the hydrogen peroxide 3% solution, as you get it from the drugstore, and dilute it 2 to 1 with water to make a 1% solution.

QUESTION: Is verticillium wilt fungus carried within seeds:

MARK MIRMAN: The fungus is on the outside of the seed and hot water treatment will eradicate it. It is not found within the seed.

QUESTION: How do you get *Gaultheria procumbens* seeds to germinate and not have the moss cover it up?

WILLIAM SMITH: At Briggs Nursery we lay down a fine layer of screened sphagnum moss then sow the seed on it and use a real fine nozzle to force the seed into the moss. Then we cover with a sheet of glass then forget about it until the seeds germinate.

QUESTION: How do you get *Acer griseum* seed to germinate quickly?

CHARLES TUBESING: This is considered to be a 2-year seed and has a hard seed coat. First, crack and remove the seed coat, then stratify. But still you get poor germination the first year. Further growth of the embryo, or something like that, is needed during the second summer, then germination will occur.

PHILIP McMILLAN-BROWSE: Collect the "seeds" (samaras) when they are green — in July, just when they turn from green to a yellow-buff color — before the hard seed coat develops. Then stratify and you will get some germination.

QUESTION: Has anyone had success with hard or softwood cuttings of filbert?

PHILIP McMILLAN-BROWSE: *Corylus avellana*, (hazelnut) softwood cuttings will root successfully under mist, but with *C. maxima* (filbert), if put under mist, the buds will rot off. They may root but no shoots develop, since the buds are gone. They both can be rooted as hardwood cuttings where the base of the cuttings is given a heat treatment before planting out — the so-called "Garner-bin" technique.

QUESTION: How do you root *Cedrus atlantica* 'Glauca' (blue Atlas cedar) cuttings?

VOICE: We treat them with Dip-N-Grow, 1-10. They can be rooted easily — no wounding — just rip off the needles. Collect cuttings December through February (in the western Washington area). Make cuttings with a little of the hardwood tissue at the base.

QUESTION: *Wisteria floribunda* or *W. sinensis* — how are these propagated — by cuttings or grafts?

MICHAEL SMITH: Cuttings taken from young stock plants root best, particularly if they are grown under greenhouse or semi-greenhoue conditions. Cuttings are best made from slender shoots, while they are still quite soft. They may root in

less than a month. Thick material from outdoor stock plants may take 2 or 3 months to root. Overwintering may be a problem. Keep them quite dry in the flats then pot them up in the spring when the buds start to swell.

QUESTION: *Nandina domestica* cultivars — is there another time to propagate them other than late fall:

DON KLEIM: We propagate all year long, as long as the plants are actively growing. We use softwood cuttings — no hormones — and use intermittent mist. Rooting takes 20 to 30 days. We retain 2 or 3 leaves on top, with the basal leaves stripped. We use young, soft growth, barely starting to harden. The cuttings are only 1 to 1½ in. long. We are located in Clovis, California, where it is relatively warm all year.

QUESTION: How do you get *Daphne cneorum* to grow on, once cuttings are rooted? Rooting is no problem.

BOB GOUVEIA: We grow them in the field in sandy soil in our area in Massachusetts. It is almost impossible to grow them in containers.

PLANTS FOR THE DISCRIMINATING PROPAGATOR

DENNIS M. CONNOR

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New plants are always coming onto the market. Sometimes they are not new at all, but just some old favorites that have gained popularity in our gardens again. The consumer today tends towards more dwarf and compact shrubs and trees because of limited space problems such as in the case of smaller lots, apartments, or condominiums. The consumer also looks for a more maintenance-free landscape. Nevertheless, we are a nation of people who love our gardens. Whether one has acres of land or only a small parcel to work with, one toils hard to keep greenery and flowers around our homes.

I have selected a few plants to discuss, ranging from the subtropical zone to the hardiest of zones, from large growers to compact, dwarf growers. Arranged alphabetically, they are as follows.

Aucuba japonica 'Mr. Goldstrike' (Family Cornaceae)

This plant came from New Zealand from Duncan and Davies. It is well noted for its excellent variegation and grows to a height of about five feet. Plants propagate easily from cuttings. Hardiness is to zone six.

Carex buchanani (Family Cyperaceae)