At first, we tried in vain to make *V. carlesii* fit into a propagation schedule which we successfully used for most of the plants that we propagate. Softwood cuttings were taken in mid-June from plants in production. We made and bundled the cuttings in the field and stored them at 45°F prior to sticking. The cuttings were treated with 10,000 ppm K-IBA and stuck in sand in a 30 ft × 168 ft quonset house and misted with a Growing Systems mist boom.

By August, 90% or better were rooted. The plants were allowed to go dormant and were lifted from the sand beds in November. The dormant rooted cuttings were then wrapped in plastic and stored in a freezer at 28°F.

Coming out of the freezer in the spring, the roots and tops of the *V. carlesii* rooted cuttings looked alive and healthy. The plants were lined out in the field in April in 3-ft beds. The beds were irrigated immediately after planting and periodically thereafter. The results were less than satisfactory—30% stands for *V. carlesii*.

Through a couple more years of trial and error, we finally have come up with a method which, we believe, will consistently give us superior results. Cuttings are taken in June with the same treatment prior to sticking. However, this time the cuttings are direct stuck in 3-in. pots in a peat-bark mix. Instead of an unheated quonset, they are rooted in a 30 ft × 200 ft, double-poly, heated quonset house. As before, a Growing System boom is used to mist the cuttings, however, one must be much more careful with the water because the peat-bark mix tends to waterlog.

After the cuttings have rooted, they are grown on and allowed to go dormant in the fall. They are then left in place and maintained throughout the winter at 28°F. The following spring the plants are allowed to break bud, grow, and are cut back once prior to planting in the field in May.

I repeat, the returns we have experienced have been excellent. Furthermore, I believe these results can be duplicated year after year.

Feeding Cuttings to a Slow Death

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Everyone has experienced those mysterious overwintering deaths that occur in seemingly healthy stands of rooted cuttings. It's easy to rationalize what caused the problem without ever really rooting out the source so as to prevent it from happening again. We faced that situation this year at Spring Meadow Nursery. Cuttings flushed and then the new shoots collapsed within a very short time. Lab reports said that no pathogens were present, but there was considerable cambium damage. The question we had to answer was "how?" or if it happened again "how would the nursery survive economically?"

Certain patterns showed up with the problem. Plants that had been stuck or potted in the last half of the year showed the most loss, but only the ones in bark media. Cuttings stuck in perlite overwintered fine, for example *Euonymus alatus* 'Compactus' were rooted in perlite and then upgraded to 2¼-in. pots in mid–September using a pine bark medium. Overwinter losses with the 2¼-in. pots were about 50%, but the ones that remained in the plugs had virtually no winter losses. Other examples are *Spiraea japonica* 'Little Princess' and *Viburnum plicatum* f. *tomentosum* 'Mariesii' that were direct rooted in a 2¼-in. pot, then shifted to a 4-in.

pot in late August. By spring a large percentage of them were dead. We formulated a couple of theories to explain the losses, but every time the focus came to fertilizer.

We had been incorporating a slow-release fertilizer with a 9-month release in all of our media. Sometime in late spring, our supplier visited the nursery with the technical rep of the fertilizer manufacturer. They analyzed our usage and then recommended a shorter, 4- to 5-month release fertilizer. It was after many discussions that we switched over to what was recommended. The plants grew well and seemed to go dormant as expected. We overwintered the crop in minimum-heated, double-poly greenhouses and then turned the heat up when they started to grow in early March. The plants had looked good all winter. Then the problem described earlier showed up. One of the discussions I had with the plant pathologist at Michigan State University clicked an idea I had never thought of before. A deciduous plant could drop it's leaves in the fall and still not go dormant. I pursued that line of thought to find out how the cambium damage occurred. Our minimum temperatures could have been set too low if internally the plant was still active, but why were they still active? We invited the representative from the fertilizer company to help solve the problem. He noticed the prills of the fertilizer were spent when there should have been some fertilizer left to get the plants going in the spring. Since we didn't keep any soil temperature data, we couldn't determine if the fertilizer had failed to perform as it was recommended. However, we did draw some conclusions.

First, the shorter-release fertilizer starts releasing quicker than we had experienced in the past. We were told it would take seven days with an average soil temperature of 50°F to start releasing. This either is false information or the release didn't shut down as predicted in the fall. This year, we didn't incorporate any slow-release fertilizer after July 1 so as to make sure it was gone by the end of October.

Second, we have grouped our plants into seven categories by growing characteristics. We hope to minimize the growing environment as a factor in overwintering deaths.

And third, we are "shading" a few houses with a sheet of white poly over the double clear sheets for the winter. We want to know how much we can reduce the variation in day/night temperature. In the spring, the white poly will be removed so the plants won't be held back.

Too many times I've heard excuses for winter losses. This is one practical lesson for which we paid dearly at Spring Meadow.