cuttings, 1 and 2 node cuttings and trials of various rooting media.

The original slice cut worked well and gave rooting considerably better than did conventional cuttings. But there were two surprises with modifications of the slice cut. One was what I call a "slant cut", in which the base of the cutting is cut at an angle to expose an area from ¾ to 1 in. in length. This worked even better if the base of the cut ended just below the back of the basal node. The other surprise was in using a single-bud cutting made like a shield bud but longer and with more wood. The shield was cut out approximately 1¼ to 1½ in. length. Rooting was phenomenal. All cuttings were made with leaves; the bases, including all cut surfaces, were dipped in Hormex powder. In one lot we included cuttings without leaves; these failed entirely.

In addition to the two cultivars used in the experiment mentioned above we also included two lots of cuttings of 'Little Darling' and 'Queen Elizabeth'. Results were similar.

To further test the idea, cuttings of the miniature rose 'Avandel' (easy to root) and 'Scarlet Gem' (slow and more difficult) were included in the first trials. Only the slice cut was used but there was a marked difference in the rooting of 'Scarlet Gem'.

No bottom heat was used; all samples were rooted outdoors under mist in our regular growing mix (⅓ fir bark, ⅓ peat, ⅓ perlite) unless noted otherwise.

NOTE: In our operation at Visalia, California, we grow between 600,000 and 700,000 miniature rose plants each year.

CO_2 AS AN AID TO ROOTING

S.E. SORENSON

Homestead Nurseries Ltd.
Clayburn, B.C., Canada

We are pleased with the use of CO_2 in our softwood cutting propagation program. For two seasons we have sent CO_2 through our mist lines to assist in rooting. Efficient rooting practices are necessary for us since this is a relatively large part of our business. Leaching and *Botrytis* infection were but a few of the problems that cut down our productivity in spite of our many sanitary practices.

In early 1977, while revising our propagation program, we discovered an article in the 1968 I.P.P.S. Proceedings entitled, "Carbonized Mist in Plant Propagation" by J.M. Molnar and

W.A. Cummings, C.D. of A. Research Station, Morden, Manitoba, Canada. This showed that CO_2 promoted rooting when sent through mist lines. Using this article as a model, we replumbed our mist lines in a poly propagation house. The results were striking. We did not have replicated trials so we cannot prove this statement by detailed measurements and rooting times, but we can attest to the results by visual means. There was less *Botrytis* on *Cornus alba* 'Elegantissma Variegata' leaves and much healthier *Prunus cistena* cuttings. In general, there was less leaching, cleaner foliage and faster rooting on all cultivars in the polyhouse.

With this initial success in our polyhouse we changed over our outdoor propagating frame in 1978 to the use of CO_2 to assist the softwood cutting propagation. Here again we are satisfied that CO_2 improved rooting.

Our softwood cutting propagation season was hardly over when *The Plant Propagator, Vol. 23 No. 3*, September 1978, arrived carrying an article — "Effects of refrigeration, CO_2, and photoperiod on the initial and subsequent growth of root cuttings of *Ilex Cornuta* 'Burfordii', by Adolph J. Laiche, Jr. of Mississippi State University," which corroborates our results with CO_2.

For the future we plan to make some mechanical improvements in our CO_2 systems. Time clocks to cut off the CO_2 around 11 A.M. when winds or ventilation systems usually start up are being considered. Possibly injectors could be used to more accurately induce CO_2 into the lines instead of using electric valves.

These are but a few ideas that we have in mind to cut down the waste, to more accurately measure CO_2 and, finally, to allow for a more trouble-free maintenance program.

We have been rooting semi-soft *Pinus mugo* cuttings for the past four years with fair success. Timing is critical in this case, for when the cuttings are too hard, they are difficult to root; conversely, when on the soft side, they fail. We feel that by using CO_2 on "soft" *P. mugo* cuttings they would survive. This could be a new horizon in softwood cutting propagation since "soft" (immature) softwood cuttings could be used for many hard-to-root cultivars.