THE ROOTING OF RHODODENDRON STEM CUTTINGS

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When I came to this country in late 1946 I was aware that cuttings of hybrid rhododendrons were being rooted experimentally in Boskoop, Holland. What was still to be proved was the value of the method as a commercial procedure, and, most important, how would plants propagated in this way develop as they matured? The information from Boskoop was therefore obtained and held as a matter of interest, but was not considered to be of immediate practical importance.

In the winter of 1946 we grafted 35,000 rhododendrons onto *Rhododendron ponticum* understocks and these were planted out the following spring. The early summer of 1947 was hot, wet, and humid with the result that catastrophic losses were sustained in not only the new batch of grafts but also more mature plants. Clearly something had to be done. Discussions with other growers indicated that plants of *R.* 'Roseum Elegans' produced by layering were apparently more resistant to the wilt disease than were similar plants grafted onto *R. ponticum*. The need to experiment was clear, but opinions were widely held that rhododendrons just could not be rooted successfully.

We first reasoned that rhododendrons were not easy to root, and that if they were to be rooted successfully every possible aid or advantage which would encourage rooting had to be brought to bear. They also had to be assembled and applied in the right order to achieve optimum conditions. What might these conditions be?

Our first line of attack was to assemble all that could be found in the published literature. When assembled the list proved to be quite substantial. Reference to the Boskoop work showed that cultivars varied in their rootability, that timing was important as it is for almost all plants and that the type of cutting used was also an important factor. In addition close control of water loss during the rooting period was essential, the medium used affected the results, hormones were most helpful, but perhaps most important of all, wounding the cuttings greatly improved both the vigor and quality of the rooting. Although this was quite a substantial amount of information we continued to collect more. F.W. Burbidge in his book published in 1875 stated that *R.* 'Cunninghams White' could be rooted. Bowers in his book said the same as did Dr. L.C. Chadwick. We found another reference to the value of wound-

ing published in 1932 by Day which underlined the importance of this technique. Then there were the papers by Guy Nearing on his special frame, Henry Skinner on his leaf bud and mallet cuttings, and Hitchcock and Zimmerman at the Boyce Thomson Institute who tested both IBA and NAA. All had successfully rooted rhododendrons, and all had managed to grow plants to a state of relative maturity with success. It seemed a generally held opinion also that plants so propagated were clearly less susceptable to the rhododendron wilt disease.

With this mass of information before us we attempted to sort out and assemble a set of criteria which should work, and at the same time to initiate tests to prove these ideas, using cuttings of *R.* 'Roseum Elegans'.

We defined success as at least 50% of the cuttings inserted should be well rooted with a strong ball of well attached roots perhaps slightly smaller than a tennis ball. The problem of attachment had been well documented. Cuttings might root with a large ball, which coming from perhaps only one or two points of attachment, just broke away as the cuttings were lifted. We reasoned that the wounding technique should overcome this but our early tests were made with a light wound which was not adequate and we lost a year before we tested a heavy wound and found this the best. These tests began in 1947, but really did not get under way until the propagating season of 1948. Three years of intensive testing and careful recording of results produced a set of criteria which were presented to the first meeting of this Society in November 1951. It cannot be overemphasized that to sort things out into an orderly progression leading to success required very close attention to minute but vital details on each experiment and on each cultivar, as the range of cultivars was extended season by season. To illustrate this, it was soon observed that thin cuttings of a lighter caliper rooted more quickly and more vigorously. Thicker cuttings might root eventually but clearly thinner cuttings had the edge. Shorter cuttings not inserted too deeply appeared to root more quickly and better than longer cuttings inserted deeper. If longer cuttings were used, they tended to root higher up the stem and not at the base. These are two illustrations of fine points of observation which might not in themselves be of much importance in the rooting of easy to root cultivars, but which clearly would count a great deal when trying to assemble the absolute optimum set of conditions to root a more difficult cultivar. These differences needed to be observed and recorded at the time each test was lifted, so that as season followed season, the whole system could be slowly and finely adjusted to achieve good results on all cultivars. This then is what we did over the next few years,

and in fact, continue to do to this day. Our observation and recording of the most minute differences never ceases, for we are still attempting to refine, or "fine tune" our results no matter how good they may be.

After the publication of our paper in 1951 many other growers tested and retested our methods but in no instance have we found any substantial changes had been made. Methods have been adjusted to new materials and techniques which are available now, but close examination will show that the basic and important points remain unchanged. Briefly, here are the suggestions made in 1951 in order of importance.

1. Timing. Optimum period, August-September.
2. Type of cutting. Thin cuttings best, avoid terminal shoots.
3. Making the cuttings. Reduce to 3-4 inches, remove surplus leaves retaining about 4.
4. Wounding. One heavy wound is essential, a double heavy wound is better.
5. Hormone treatments. Essential to success, (0.8%) IBA on easy cultivars and up to 2% IBA on difficult ones.
6. Medium. At that time we suggested 90% peat and 10% grit.
7. Sticking. Do not insert too deeply,. Space cuttings so that leaves do not lie on each other.
8. Bottom heat. Maintain a temperature of 70°F.
9. Humidification or mist. Some form of controlling water loss is essential. Regular misting was the method suggested at this time.
10. Air temperature in the house. Try to keep this down by a water film or ventilation, but without drying out the cuttings.
11. Light intensity. Maintain the maximum light level without damage to the cuttings by drying out or burning.

It is interesting to compare these suggestions with what we are doing now nearly 30 years later, for the changes indicate what has been achieved by "fine tuning" over the years.

1. Timing. Now not considered so critical. With a better understanding of the importance of other factors cuttings are being rooted from early July through January.
2. Type of cutting. Thin ones still the best, but we root the thicker ones more easily. Very thick terminal shoots should still be avoided.

3. Making the cuttings. A double heavy wound is standard and leaves are often reduced in size up to 50% without apparent harm.
4. Hormone treatments. Still important, but we have a much wider battery of chemicals, mixtures and strengths to meet individual needs. Powders are generally used and contain the fungicide Benlate at 5%.
5. Medium. The standard is now 50% peat and 50% perlite.
6. Insertion. The same.
7. Bottom heat. The same but a much greater use is being made of natural summer heat in July, accepting much higher air temperatures and protecting the cuttings with heavy misting.
8. Mist (humidification). In general use. However the value of a closed case covered with polyethylene as a method of controlling water loss has been demonstrated.
9. Air temperature. Not so critical with the proper use of a good mist system.
10. Light intensity. Still critical, but it is clear that much higher light levels can be used with benefit if the cuttings are well misted.

In conclusion, what we did to solve a difficult propagation problem was the following:

1. Recognize and define the problem.
2. Assemble all available published information bearing on the problem.
3. From this material assemble what would seem to be the most logical and effective set of procedures which should lead to success.
4. Recognize areas of doubt, in which tests are needed to pinpoint optimum needs.
5. Commence a series of tests, using the easiest possible type to handle, in which unknowns are sorted out and optimums established.
6. Observe, record, and evaluate these tests in minute detail. As information becomes available, "fine tune" your methods by small adjustments, looking for an improvement in each case.
7. Continue until the production of all types of the desired plant is a practical and commercial success.