Variables Involved in Rooting Rhododendron Cuttings©

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INTRODUCTION

The mission of the Rhododendron Species Botanical Garden is to build and maintain a comprehensive collection of species rhododendrons. This requires that we send collectors into the field to acquire plant material from the entire range and distribution of the genus that implies a great deal of plant variety. Rhododendrons grow from the tropical latitudes to the tundra of Siberia and most habitats in between. Much of the plant material that we grow is not in general cultivation and, therefore, not commonly propagated which has led to some difficulty in replicating many of them. As a result of this difficulty I have come to view the general rules of cutting propagation as variables. Looking at these variables individually has helped me develop practices that have increased our success rate with cutting propagation. By viewing each of these variables as something to be manipulated either individually or in combination and by keeping close records we have done pretty well with new plant material coming from lands far away. This is of course nothing more than a review of how to use standard propagation practices but I find that review of things such as this are often helpful and seldom done.

Before looking at some of the variables of cutting propagation for rhododendrons let me list a few things I will call "constants."

CONSTANTS

Observation. Attention to details involving the plants in question, cultural conditions, and details of every step of the process involved with replicating the plants desired.

Cleanliness. With each step of the process the propagator should be concerned with keeping the plant material and the work spaces involved as clean as possible.

Record Keeping. It nearly goes without saying that clear and concise records should be kept of propagation. Especially with plant material that has no propagation history, it is important that records be kept with as much detail as one can manage if anything is to be learned and successes repeated and failures remembered. Many rhododendrons have a narrow window of opportunity for rootability and record keeping is the only way to close in on the requirements that will achieve success.

Really Sharp Tools. Dull tools cause damaged tissue that, in turn, feed microorganisms that will move into the damaged tissue and then opportunistically move on to the rest of the tissue of the cutting, often causing it to rot. Dull tools also lead to sloppy methods. Notice that once a tool is determined to be extremely sharp, its use becomes far more precise than a tool that is dull. All propagators should know how to sharpen the tools of their trade!

Heirarchy of Rootability.

- Difficult to root = More attention to detail.
- Easy to root = Less detail required.

VARIABLES INVOLVED IN ROOTING CUTTINGS AT CUTTING TIME

Time of Year. Many rhododendrons have a very narrow window of opportunity when it comes to their ability to form adventitious roots. This is also an easy variable to manipulate if the window is unknown. With intuitive knowledge of timing of cuttings and record keeping the best time of year for taking cuttings of a particular species can easily be determined.

Time of Day. This is not so variable, but is important to mention. If cuttings are taken from the stock plant late in the day they are under transpirational stress as soon as they are removed from the stock plant. Shifting the time of day when the cuttings are taken to early morning when the rate of transpiration is lower and tissues are turgid will eliminate some of the immediate water loss a cutting suffers thus increasing the chances of rooting. This can be the difference between success and failure on plants that are moderately difficult to root.

Type of Cutting Selected: Lateral, Terminal, Flowering, and Vegetative. The ability of a cutting to form roots is controlled by many factors and among them is the hormonal status of the plant or plant parts in relation to one another. This gives us another interesting and useful set of variables to manipulate in the pursuit of greater rooting success. Some plants produce growth with a flower bud at every terminal which, as nursery stock is very good, but from a propagation standpoint is not necessarily so good. Many plants will form roots on flowering wood, but the hormonal changes that initiate flowering act to inhibit root formation so if a plant is difficult to root one might consider taking only cuttings that do not have flower buds. The question always arises: can the flower buds be removed from the cuttings? Well, yes they can, but for difficult-to-root plants this is not necessarily productive as the change that has taken place in the tissues of the plant to cause flowering cannot be reversed by removing the flower bud, so, it is no more likely to root. This also adds an injury to the cutting that makes it more susceptible to decline by fungal infection in the cutting bed.

Likewise, there is a hierarchy of rootability between vegetative terminal growth and lateral growth of plants that can be a useful variable to manipulate in pursuit of rooting success. Apical dominance of a terminal cutting can reduce the capacity to form roots, so it may be productive to select nonterminal or lateral cuttings.

Location of Cutting Selection — Sun and Shade. It is often useful before taking cuttings from a stock plant to walk around the entire plant and closely observe the condition of the possible cuttings that can be taken from all sides of the plant. This is useful for taking cuttings grown in different light levels from the same plant. In this way the propagator can determine an optimal level of sunlight by recording the situations of batches of cuttings; for instance, collected from the north side or the south side of the plant. It is also important to notice subtle clues the plant will express if it is exposed to too much sun which can be a stress possibly diminishing the plants capacity to initialize roots.

Juvenility. It has been shown that many plants in their juvenile stage, that is, before flowering maturity, are much easier to root than those that are mature.

This has occasionally been true of rhododendrons I have worked with and those collections that are known to be difficult to propagate vegetatively are often easily grown from seed. I have had occasion to grow a crop of seedlings and take cuttings from them as soon as they are large enough and most of the time they root quite easily. Of course, if clones of a particular selection are required then this variable will be of little use, but for increasing your numbers of species plants this can be an effective method.

Some rhododendrons can be induced to partial juvenility through severe pruning especially those rhododendrons with a tendency for rapid growth stimulated by pruning. In this manner clonal propagation of some selected material may be accomplished.

Physiological Condition of Stock Plants. Disease pressure, cultural conditions, and water relations of the stock plants in question are important variables that can come into all manner of manipulation. A plant that is diseased or growing under poor cultural conditions should be grown back to health before attempting to root cuttings from it. However, the eternal optimists we are, we often try anyway, usually to find out that cuttings taken from these poor plants don't do so well.

Water relations are of high importance as well. Plants should be well-watered prior to cutting removal, preferably the night before so that the material taken is turgid and will not dehydrate prior to being prepared for the growth chamber. On the other hand, cuttings taken from a plant that is growing in too much water will be less likely to root and should be moved to more suitable cultural conditions before attempting to root cuttings from it.

Fertility Level of the Stock Plant. Plant tissues must have moderate levels of nitrogen and other nutrients in them to root. Also, plant tissues that have too much nitrogen seem to rot very quickly in the warm and wet conditions of a rooting chamber owing to the fact that nearly every pathological organism in their environment is also looking for nitrogen. Nutritional levels in stock plants can be an important variable to manipulate and can be done with relative ease with close observation and good record keeping.

Carbohydrate versus Nitrogen Level in Cutting Stems. This variable relates to both the fertility level of the stock plant and the time of year in which the cuttings from a particular plant are taken. I mentioned earlier that many rhododendrons have a narrow window of opportunity when cuttings will root. This has to do with the "ripening" or stage of lignification of the cutting material in relation to the level of nitrogen contained in the stem. This can be useful as a variable in timing cutting removal from stock plants by developing an intuitive skill in the propagator of taking "snap tests" of cuttings throughout the possible cutting season as an indication of readiness of the cuttings. I have seen many propagators remove a cutting from a plant and bend it in half, maybe more than once along the length of the stem, to get a feel for the texture of the stem breaking. When the ratio of carbohydrate to nitrogen approximates the optimal rooting time the stem will have a good snap feel to it and can give an idea if the general timing for taking cuttings is correct. I know it sounds a bit folkloric, but it seems to be a pretty good rule of thumb when working in the field.

VARIABLES INVOLVED IN ROOTING CUTTINGS AT CUTTING PREPARATION TIME

Cutting Length. Attention should be paid to the length of the cutting stem and where the final cut is made. Often it is helpful to cut near or even through a latent bud or node, thus stimulating a meristematic site. Stem length must also be long enough to support the cutting in the medium, but short enough not to have the leaf material waving around in the atmosphere high above the medium supporting it; again, another detail that can be manipulated in the quest for better results.

Leaf Removal. Reduction in leaf surface area and hence transpirational water loss can be an excellent variable. A death commonly suffered by cuttings is caused by dessication. This can be easily moderated by leaf removal. With record keeping, a good balance between transpirational surface and photosynthetic capacity can be found for any particular plant being propagated. This can increase your chances of rooting difficult rhododendrons.

Wounding and Rooting Substances (Hormone Analogs). With difficult-to-root rhododendrons I pay careful attention to wounding and end cuts. Wounding is a nice variable to work with as wounds can be larger or smaller, more or less aggressive or any number of different styles. One thing they should not be is sloppy, i.e., leaving thin tissue flaps and crushed or bruised tissue. This is where very sharp tools become important. With plants that are difficult I do not use pruners for end cuts as they cut with one side and crush with the other. This leaves bruised and damaged tissue which will die, feeding fungal and bacterial organisms and causing the whole cutting to rot because of the tissue damaged in the preparation. We use knives for preparing cuttings and sharpen them to a keen edge to prevent tissue damage and to keep the propagator from becoming lackadaisical.

In conjunction with end cuts and wounding there are many rooting hormones or analogs of plant hormones that promote rooting and can be varied in strength, application, and type.

Indumented Leaves and Stems. An interesting, but sometimes problematic, feature of many species rhododendrons is indumentum. This often densely furry material can be quite attractive on the plants, but on cuttings it can sometimes interfere with physical contact with the rooting medium thus creating an airspace that can inhibit rooting. On most indumented species this material can be rubbed off to improve contact if labor time is not an issue or it is a very valuable plant which needs to be replicated. Likewise, indumentum on the tops of leaves (known as tomentum) will often stay too wet in mist beds and quickly form a dark layer of algae that shuts off the photosynthetic surface of the leaf and certainly will inhibit rooting. Again, with most rhododendrons this material is easily rubbed or washed off which can be most helpful.

VARIABLES ON THE CUTTING BENCH

Water Relations. The optimal atmosphere for rhododendron cuttings is generally fairly consistent, but for plants that seem to rot too quickly or suffer from botrytis or other fungal infection even after disinfection it is possible to experiment with varying levels of mist and humidity. Another variable related to this is rooting medium temperature. It is important to pay close attention to the physical interaction be-

tween these bench conditions as changing one of them affects the others. It is easy to lower the misting interval, but doing so can cause drying of the flats from bottom heat so hand watering may be required to replace the water in the medium which was previously supplied by the mist. Attention to details is important.

Rooting Medium. The three things important to a rooting medium are support of the cuttings, water holding capacity, and airspace. All three of these items can be changed and manipulated to supply a specific need for any particular plant.

Light. Again, three variables to be worked with are light quality, intensity, and day length. There are any number of ways these variables can be changed to produce results. An example of this in rhododendrons is the North American group of deciduous azaleas. They generally root quite easily and can be potted on and they look fine, but if they do not get extended day length (at least at our latitude) they will go dormant and then never grow again. The terminal buds will still be green and the cambial tissue alive and they can remain that way for 2 or more years and still not grow. Given extended day length immediately after they are rooted, until they push new growth then taken away from intensive growth and allowed to go dormant and overwinter outdoors or in a cold frame, these plants will grow the following spring in their normal fashion.

The overview of the variables I have listed is brief and certainly not comprehensive, but they have been instrumental in helping me achieve some success in rooting many species rhododendrons that are thought to be very difficult. In my experience with new and often unknown plant material I have found that careful observation and detail-oriented practices plus simple thought of variables involved with the physiology of forming adventitious roots can go a long way in the success or failure of rooting species rhododendrons.