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Nursery-Scale Production of Native Azaleas from Seed

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INTRODUCTION

At Carolina Native Nursery in mountainous western North Carolina, we grow 12 species of deciduous azaleas that are native to the southeastern United States. Over the past 15 years, we have honed our seed-growing protocol for this special group of ornamentals, native shrubs. We start from seeds and eventually finish in 3-gal containers. What follows is a summary of our methods.

SEED COLLECTION

We collect seed from several locations with the appropriate permission. Interspecific hybrids occur in nature, so be aware of the potential for crossing where species are growing close together. This type of genetic exchange is entirely natural and happens all the time, so we generally do not go to great lengths to avoid cross-pollinated seed. For clients who would prefer a uniform bloom color or stature, we offer tissue-cultured hybrids and varieties. However, for those who are interested in planting native ornamentals for the benefit of local eco-systems - genetically diverse, seed-grown plants are where it is at.

It is advantageous to gather the widest sample of available genetic diversity, so we collect from as many plants as possible. Of course, whenever collecting any type of material from the wild, it is essential to tread lightly and use ethical standards on how much to take. We never collect any more than 20% of the seed from an individual plant, or from the community at large. Please do not collect from the wild if you are unwilling to follow sustainable harvest standards.

Seed collection happens in October and November in our climate, and will vary depending on species, microclimate, and the weather in a given year. It is helpful to first visit the stands where you plan to collect seed during the bloom season. Of course, the plants are much easier to find at that time and seeing the flowers will help you identify what species you are working with. Seeds of *Rhododendron* species are mature when the seed pods have turned brown and are just beginning to split. This is the best time to collect. However, pods can be collected when

still green (if at their full size), and then carefully dried to allow seeds to fully mature.

Once collected, leave mature pods to dry in a single layer in a cool place with adequate air flow and no direct sunlight. If seeds are mature when picked, one week of drying time will be sufficient before cleaning. If working with green pods, a longer drying time will probably be required. Once completely dry, seeds not needed for sowing can be stored in the freezer indefinitely. These seeds need no stratification and can be sown immediately if desired.

SOWING

We sow cleaned azalea seeds into community flats [25 x 51 x 5 cm (10 x 20 x2 in.)] in mid to late-November. The flat is filled with about 4 cm (1.5 in.) of our standard composted pine bark medium, which also contains dolomitic lime and a humic acid product. On top of that, we place 0.6 cm (.25 in.) of pre-moistened ground peat moss, which is tamped down with a tool to make an even planting surface. Seeds are sprinkled by hand on top of the peat. The goal is to end up with 700-1000 seedlings per flat. This is a heavy seed rate, but we will transplant seedlings into cell trays starting in March, avoiding issues of fungal diseases developing because of insufficient air flow in the thick stand of the seedlings. We have not found it necessary to cover the seeds with more peat. We then use a hose-end mist nozzle to fully wet the seeds, which also functions to push them down, ensuring full contact with the peat.

Community flats are placed on bottom heat inside of a 3-mm clear poly humidity tent (or with individual humidity domes on each flat) within the greenhouse and monitored carefully for moisture (Figure 1). Flats should not dry out on top, nor should they be soaking wet. A thermostat is set using a soil sensor to keep the root zone at about 21°C (70°F). During extremely cold weather, we may turn the bottom heat setting up around 24°C (75°F) to ensure the tent stays at or above 10°C (50°F) overnight. A continuous photoperiod is provided using 600w HPS lights that come on at dusk and turn off at dawn. Germination should occur within about 3-4 weeks; at which time we begin a weekly maintenance schedule to provide fertility and avoid pest and disease threats.

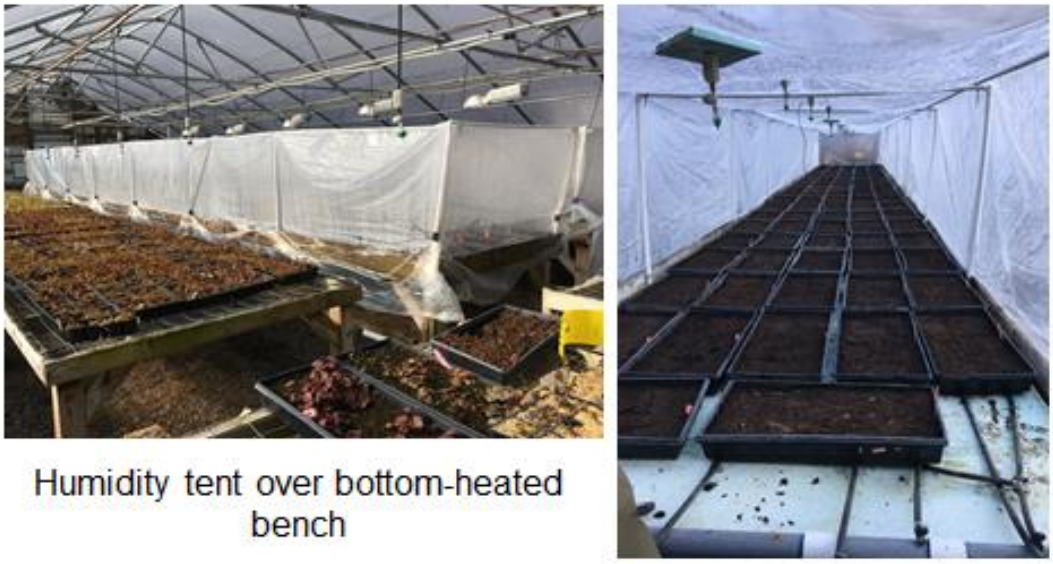

Figure 1. Humidity tent (left) and inside the humidity tent with bottom-heated bench (right).

SEEDLING MAINTENANCE

When germination has clearly begun, we begin our maintenance schedule which involves weekly drenching with products to provide fertility and protect against pests and diseases (Figure 2). Fungus gnats and fungal diseases are the main pests that we worry about during this stage.

Figure 2. *Rhododendron periclymenoides* seedlings in flats in early January after being sown in November 29, 2017.

We use a checklist format for keeping track of this schedule, which is an easy way to ensure we are using a proper fungicide rotation (to avoid pathogens gaining resistance) and to make sure we get the work done on schedule (Figure 3). We use water-soluble fertilizer with minor nutrients included to provide fertility. The checklist includes the analyses of the two fertilizers we rotate. Following the checklist, we step-up the fertilizer rate gradually as the plants grow. We start out using ¼ of the label rate on tiny seedlings, and step-up to ½ rate when seedlings have developed 2 true leaves, and again to ¾ or full rate when they have 4-6 true leaves.

We follow this maintenance procedure until the seedlings are transplanted in March-May. Once seedlings have leaves, make sure to open up the humidity structure to vent on days when the sun is out. It is surprising how quickly the clear poly can warm up on a sunny day even in January. The seedlings need sufficient air flow during these times. Bottom heat and supplemental lighting are turned off in March, at least two weeks before we plan to transplant.

December 22	**December 29**	**January 5**	**January 12**
• 20-20-20 ¼ tsp/gal • Zerotol ½ TBS/gal • Captan 1 TBS/gal • Change sticky cards, scout for pests	• 12-48-8 ¼ tsp/gal • Gnatrol ½ tsp/gal	• 20-20-20 ¼ tsp/gal • Actinovate 1tsp/gal • change sticky cards, scout for pests	• 12-48-8 ¼ tsp/gal • Essential 2 oz/gal • Gnatrol ½ tsp/gal
January 19	**January 26**	**February 9**	**February 16**
• 20-20-20 ¼ tsp/gal • Zerotol ½ TBS/gal • Change sticky cards, scout for pests	• 12-48-8 ½ tsp/gal • Gnatrol ½ tsp/gal	• 20-20-20 ½ tsp/gal • Triathlon BA 2 tsp/gal • Change sticky cards, scout for pests	• 12-48-8 ½ tsp/gal • Essential 2 oz/gal • Gnatrol ½ tsp/gal

Figure 3. Azalea seedling care checklist, winter 2018.

TRANSPLANTING SEEDLINGS

Once seedling flats have been properly hardened off, we are ready to transplant the azaleas for the first time. We use our composted pine bark medium in RootMaker 18-cell flats, which are placed on benches in a cold frame with a 30% shade cloth.

Seedlings are taken from the flats in chunks and carefully separated to preserve the roots. We have built ourselves a dibble board with wooden dowels, which we press onto the flats to make the necessary holes in each cell to plant into. Transplanting seedlings at the correct depth requires some skill (Figure 4). Each tiny plant needs to be placed no deeper than it was originally growing in the flat, but not so high in the cell that the small plant flops over when watered. We generally assign this task to our most skilled workers - because so much of the quality of our future crop depends upon this step. Once each flat is complete, we sprinkle 20 grams of Harrell's Polyon® 16-6-11+ micros-controlled release fertilizer (CRF) evenly over the entire flat, and water thoroughly by hand.

Figure 4. Freshly transplanted *Rhododendron canescens* seedlings, April 1, 2018

Once a block of seedling transplanting is complete, we drench with Actinovate (*Streptomyces lydicus* strain WYEC 108) or a similar biological fungicide. If transplanted by the first of May, seedlings can be expected to fully root into cells before the first of September (Figure 5). We use a hedge trimmer to prune the seedlings back to a consistent height about two months after transplanting, when lots of active growth is present. We repeat this trimming 2-3 more times throughout the season to encourage branching.

Figure 5. Azalea liners in propagation house, September 2018.

Seedlings are overwintered in cold frames with 30% shade and no supplemental heat. Sufficient air flow provided by fans and/or opening doors on clear and sunny days is important for preventing development of fungal diseases and liverwort/moss invasion.

SUBSEQUENT TRANSPLANTING AND MAINTENANCE

The young azaleas are ready to be transplanted again the next spring. Around early April, we pull them from the cell trays, gently loosen the root mass, and transplant to a 1-gallon pot (Figures 6 and 7). Planting at the proper depth (root crown must be no lower than it was in the cell) is just as important at this stage. However, it is easier to do since you are working with larger material. We then topdress each pot with 10 grams of the Polyon® 16-6-11 CRF, and cover that with a 2.5 cm (1-in.) layer of rice hulls, which acts as a mulch to keep down weeds and maintain a more constant moisture level within the container. One-gallons are set on the ground (gravel) in cold frames with 3mm opaque overwintering poly covering. We vent these cold frames by opening the doors on any day with temps above about 3°C (38°F). Around the time the leaves have expanded on the local trees, we take down the poly covering and replace with 30% shade cloth.

We do not currently space 1-gal containers, but it may be advantageous to do - because it leads to a fuller-shaped plant, and results in greater airflow, which can prevent fungal infection. Leaf rust is something to keep an eye out for at all stages of growth. Azaleas can be expected to fully root into the 1-gal containers by August or early September (Figure 8). One-gal azaleas are hedge trimmed 3-4 times throughout the season, taking just an inch or two off the tops of the plants to maintain height consistency and encourage more branching.

The next spring, azaleas are transplanted in the same manner to 3-gal containers. We hedge trim the blocks one more time before preparing plants for transplant. We have used both squat pots and standard 3-gal with success. Three-gal containers receive a topdressing of 38g Polyon® 16-6-11 CRF, and again 2.5 cm (1 in.) of rice hulls. The pots are spaced about a foot apart on all sides.

Figure 6. *Rhododendron austrinum* liners, Sept 4, 2018. Transplanted on April 20, 2018.

Figure 7. Bed of 1-gal *Rhododendron atlanticum*, June 12, 2018. Seedlings were transplanted March 22, 2018.

Three-gal plants may be hedge trimmed once after blooming, if needed. We make a pass through 3-gal crops in June or July to hand-prune branches growing at strange angles.

Fertility is supplemented throughout the season with water-soluble fertilizer and other sources of nutrition (like kelp extract) as a foliar spray - depending on how the growth is looking and what our electro-conductivity (EC) readings are for the containers. With the exception of hand-watering just after transplant, containers are watered via overhead irrigation in a cyclical pattern (i.e., watering for two cycles with an interval in between, rather than one long cycle). This increases absorption capacity and decreases runoff in our fast-draining medium.

Azaleas transplanted into three-gallon containers in March or April can be expected to be fully rooted and sellable by mid-August through September (Fig. 9). In this manner, we can produce a finished crop of three-gal azaleas from seed in three growing seasons.

Figure 8. Growth of 1-gal *Rhododendron atlanticum* on June 6 (left) and September 28 (middle); seedlings were transplanted on March 22, 2018. Growth of 3-gal *Rhododendron atlanticum* on 26 September 2018 (right); seedlings were transplanted on 15 March 2018.

INTEGRATED PEST MANAGEMENT (IPM)

During all stages of growth, we practice Integrated Pest Management (IPM). We continually scout, identify, and strive to prevent pest and disease outbreaks. We have found that working to prevent pest problems through regular scouting, encouraging beneficial predators, using cultural strategies like spacing, and preventative spraying - can reduce the time needed to manage these problems. We also strive to reduce the costs of chemical inputs. Once we see a growing presence of our common pests such as western flower thrips in the spring - we begin a bi-weekly spray program intended to prevent pest populations from reaching the threshold of economic damage.

Our rotation this season included neem oil, Mainspring (cyantraniliprole), and a tank mix of azadirachtin and the ento-mopathogenic fungus *Beauveria bassiana.* We aim to incorporate a fungicide into the rotation about every 6 weeks, but this interval may decrease if there is an acute problem present.

We rotate through many fungicides including biological fungicides and some traditional classes, such as thiophanate methyl and strobilurin. Tank mixes may also include foliar fertilizers as appropriate; be sure to check that tank mix component are compatible. We continue our bi-weekly spraying until pest pressure has died down. Sticky cards placed throughout the nursery help us monitor insect presence and abundance throughout the season.

Propagating azaleas from seed is not a new topic to IPPS. We would like to credit J.P. Jackson and Lindy Johnson (and all those who came before), who authored the paper in the IPPS annals which we have used as a jumping-off point for our protocol (Jackson and Johnson, 2013). Hopefully we have been able to add a few nuggets of azalea wisdom to the collective consciousness by hashing over the details of our own standard operating procedure.

For further information, please check out our YouTube channel where you will find a three-part video on propagating native azaleas.
https://www.youtube.com/watch?v=phOO-YS8taA

Literature Cited

Jackson, J.P. and Johnson, L. (2013). Growing Native Azaleas from Seed. Comb. Proc. Intl. Plant Prop. Soc. *63*: 441-442.