

**Seed Germination of Three Provenances of
Rhododendron catawbiense:
Influence of Light and Temperature**

**D. Bradley Rowe, Frank A. Blazich, Stuart L. Warren, and Thomas G. Ranney
North Carolina**

Nature of work: *Rhododendron catawbiense* Michx. (Catawba rhododendron) is a broad-leaf, ericaceous evergreen species indigenous to the mountains of West Virginia and Virginia, extending south to North Carolina, Georgia, and Alabama. It is a prized landscape plant, blooming in late spring with showy flowers ranging from lilac-purple to paler lilac-rose and occasionally white. Traditionally, the principal means of meeting demand in the Southeast has been harvesting of mature, native plants or "cutbacks", produced when the tops of mature plants are removed (cut back) to within 8 to 10 cm (3 to 4 in) of the soil surface. The latter are then dug and replanted in the field for further growth prior to sale. Both of these practices deplete native stands. Other methods of production, such as sexual propagation, have not been widely utilized in the Southeast due in part to lack of published protocols regarding such practices.

In recent years, popularity and demand for *R. catawbiense* have intensified due to increased interest in native plants. To help satisfy demand, many nurserymen are attempting to utilize sexual propagation. Recently, Blazich et al. (1) reported on the influence of light and temperature on seed germination of a high elevation provenance of *R. catawbiense* located in western North Carolina [35°42'N, 82°22'W, elev. = 1860 m (6100 ft)]. However, in North Carolina and other areas of the southeast, isolated provenances of *R. catawbiense* occur at much lower elevations. These populations may possess desirable horticultural traits (e.g. greater heat tolerance) not found in germplasm originating at the higher elevations. Differences regarding influence of various environmental factors (e.g. light and temperature) on seed germination may also be present. Therefore, the objective of this research was to examine the influence of varying photoperiods and constant versus alternating temperature on seed germination of three provenances of *R. catawbiense* representing diverse geographical and altitudinal distributions.

Mature seed capsules were collected from native stands of open-pollinated plants of *R. catawbiense* growing in Johnston Co., N.C. [35°45'N, 78°12'W, elev. = 67 m (220 ft)], Cherokee Co., Ga. [34°20'N, 84°23' W, elev. = 320 m (1050 ft)], and Yancey Co., N.C. [35°45'N, 82°16'W, elev. = 1954 m (6410 ft)] on October 6, October 12, and November 10, 1992, respectively. Following collection, capsules were dried at 20°C (68°F) for 30 days. Seeds were then removed from the capsules (approximately 160,000 seeds per ounce), and stored in sealed glass bottles at 4°C (39°F). In January 1993, seeds were graded and sown in covered 9 cm (3.5 in) glass petri dishes containing two prewashed germination blotters moistened with tap water. Seeds were placed in the dishes (50 seeds per dish) with half designated for germination at 25°C (77°F) and the other half for germination at an 8/16 hrthermoperiod of 25°/15°C (77°/59°F). All dishes were

placed in black sateen cloth bags and were randomized within two growth chambers [C-chambers (2)] set at the appropriate temperatures. Within each temperature regime, seeds were subjected daily to the following eight photoperiods: total darkness, 1/2, 1, 2, 4, 8, 12, or 24 hr.

Growth chambers were equipped with cool-white fluorescent lamps which provided a photosynthetic photon flux (400-700 nm) of $28 \mu\text{mol}\cdot\text{m}^{-2}\cdot\text{s}^{-1}$ (2.2 klx) as measured at dish level. All photoperiod treatments, except total darkness and the 24 hr irradiation, were regulated by removal and placement of the petri dishes in black sateen cloth bags. Petri dishes remained continuously unbagged in open chamber conditions for the 24-hr photoperiod treatment. Constant darkness treatment was maintained by keeping petri dishes in the black cloth bags throughout the experiment. For constant darkness, watering and germination counts were performed in a darkroom utilizing a fluorescent lamp equipped with a green acetate filter. All germination blotters were kept moist with tap water throughout the experiment.

Each photoperiod treatment was replicated four times with a replication consisting of a petri dish containing 50 seeds. Germination counts were recorded every 3 days for 30 days. A seed was considered germinated when the emerging radicle was ≥ 1 mm (0.04 in). Percent germination was calculated as a mean of four replications per treatment. Within each temperature, for a provenance, data were subjected to analysis of variance and regression analysis.

Results and Discussion: Regardless of temperature or provenance, seeds required light for germination and subjecting seeds to daily photoperiods as short as 1/2 hr increased total germination to 98% for the Yancey Co. provenance, 85% to 92% for the Johnston Co. provenance, and 87% to 91 % for the Cherokee Co. provenance. Seeds from Yancey Co. exposed to photoperiods 2 1/2 hr began germinating between days 3 to 6 at 25°C (77°F) compared to days 6 to 9 at 25°/15°C (77°/59°F). However, seeds from Johnston Co. and Cherokee Co. exposed to photoperiods 2 1/2 hr began germinating between days 6 to 9 at 25°C (77°F) compared to days 9 to 12 at 25°/15°C (77°/59°F). Regardless of temperature and photoperiod, seeds of the Yancey Co. provenance consistently germinated earlier and had greater cumulative germination.

At 25°C (77°F), photoperiods > 8 hr inhibited germination of seeds from Yancey Co. At 12 days, inhibition was still present for the 24 hr photoperiod, but by day 15 germination for all photoperiod treatments except total darkness was 97%. Inhibition of germination at 25°/15°C (77°/59°F) was more pronounced, since an aHemating temperature can partially substitute for the light requirement for some species (4). Inhibition was first noted at day 9 for photoperiods > 2 hr, but by day 18, cumulative germination for all photoperiods except total darkness ranged from 95% to 99%.

Seeds of the Cherokee Co. provenance also exhibited inhibition of germination at particular photoperiods and this inhibition lasted for a longer period of time. Seeds germinated at 25°C were inhibited by photoperiods > 2 hr; however, by day 18 germination for all photoperiods with the exception of total darkness ranged from 74% to 88%. At 25°/15°C (77°/59°F) inhibition was first noticed at day 12 for photoperiods > 2 hr

which continued throughout the study. The inhibitory affect of the 24-hr photoperiod was again more pronounced at 25°/15°C than 25°C. Cumulative germination by day 30 for all photoperiod treatments except total darkness ranged from 70% to 91% with maximum gemmination of 91% occurring at the 2-hr photoperiod.

Generally, for equivalent photoperiods, inhibition when present, will be more pronounced at 25°/15°C (77°/59°F) than at 25°C (77°F) and will dissipate by the end of a 30-day germination period (1). However, inhibition of seed germination of the Cherokee Co., Ga. provenance by photoperiods > 2 hr at 25°C (77°F) and 25°/15°C (77°/59°F) was still observed at day 30. This suggests the germination response of the Cherokee Co. provenance to light and temperature might be unique.

Greater seed vigor of the Yancey Co., N.C. provenance also extends to seedling growth. Rowe (3) compared seedling growth of the Yancey and Johnston Co. provenances over a range of day/night temperature regimes. Total seedling dry weights of the Yancey Co. provenance were greater ($p < 0.05$) at all temperature combinations compared to seedlings of the Johnston Co. provenance. In addition, 2 years after the aforementioned study was conducted, visual observations of containerized plants representing these two provenances confirmed previous results.

Significance to Industry: Generally, light and temperature requirements for seed germination of different provenances of *R. catawbiense* were similar. Regardless of temperature or provenance, seeds require light for germination, and daily photoperiods as short as 1/2 hr will maximize germination. The major difference in germination response of different provenances was related to vigor. Seeds of a high elevation provenance germinated at a faster rate with greater cumulative germination than seeds of lower elevation provenances. Small seed size plus the requirement of light for germination should caution nurserymen not to cover the seeds during propagation.

Literature Cited

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