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Effects of Pinching on Growth and Floral Initiation and Development of Container-grown Rhododendron[1]

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Abstract. **Plants of *Rhododendron* X *catawbiense* Michx. cvs. Chionoides, Roseum Elegans, and Nova Zembla were cut back on May 14, 1974 and terminal buds removed at 2-week intervals throughout the summer starting on June 14 and examined microscopically for floral initiation and development. First evidence of floral initiation was found in samples taken on July 15 for 'Chionoides' and August 1 for 'Roseum Elegans' and 'Nova Zembla'. Floral development continued in the buds of all cultivars into October, at which time buds were well developed and at the rest stage. The number of breaks resulting from removal of terminal buds was the greatest on plants pinched on August 1 and August 15. The percentage of breaks forming flower buds decreased on plants pinched after August 1 and no flower buds were formed on plants pinched after August 15.**

Adams and Roberts (1) reported that flower initiation and leaf and stem elongation occurred concurrently in greenhouse-forced *Rhododendron* X *catawbiense* 'Roseum Elegans'; flower initiation required only 3 weeks. According to Johnson and Roberts (3), flower initiation occurred when terminal shoot length was about 20 to 29 mm. Kohl and Sciaroni (4) found that azaleas pinched in June and July required about 45 days for flower bud formation; plants pinched after August 11 required a much longer time or failed to form flower buds.

This investigation was undertaken to study the effect of pinching dates on new shoot growth and the histological development of flower buds of outdoor container-grown rhododendrons.

Materials and Methods

Ten 2-year-old plants each of rhododendrons 'Roseum Elegans', 'Nova Zembla', and 'Chionoides' were grown outdoors in 7.6 liter (2-gal) containers. All plants were watered daily with automated individual pot waterers and received 200 ppm of N, from 20 N–8.6 P–16.6 K (20-20-20) commercial fertilizer[4], once a week from May until September applied with sufficient volume to produce some leaching.

On May 14, plants were cut back and 3 shoots were tagged at random on each plant to provide buds for future sampling for evidence of floral initiation and development. At 15-day intervals from June 14 to October 15, 1974, 1 bud from each of 3 tagged shoots from a single plant of each cultivar was removed, fixed in formalin-acetic acid-alcohol (FAA) and prepared for sectioning and microscopic examination according to the procedures described by Johansen (2) and Sass (5). Each date of terminal bud removal provided material to document the histological development of rhododendron flower buds, and served as the pinching treatment for observation of regrowth and flower bud formation at the end of the growing season.

Results

Floral initiation and development. First evidence of floral initiation on plants which were cut back on May 14 was found in bud samples taken on July 15 for 'Chionoides', and August 1 for 'Roseum Elegans' and 'Nova Zembla'. Floral development continued in all cultivars during August and September. All floral parts were differentiated and highly developed, and the buds were at rest by October (Fig. 6).

Stages of floral development of a rhododendron bud from initiation to rest are shown in Fig. 1-6. On June 14 (4 weeks after pinching) the primary meristem was narrow and dome-shaped (Fig. 1). Leaf primordia were in a plane at an angle of about 30° from the projection of a line at right angles to the central axis of the apical meristem. On August 1 the apical meristem had become broader, flatter, and leaf primorida were in a plant at an angle of 45° from the projection of a line at right angles to the central axis of the apical meristem

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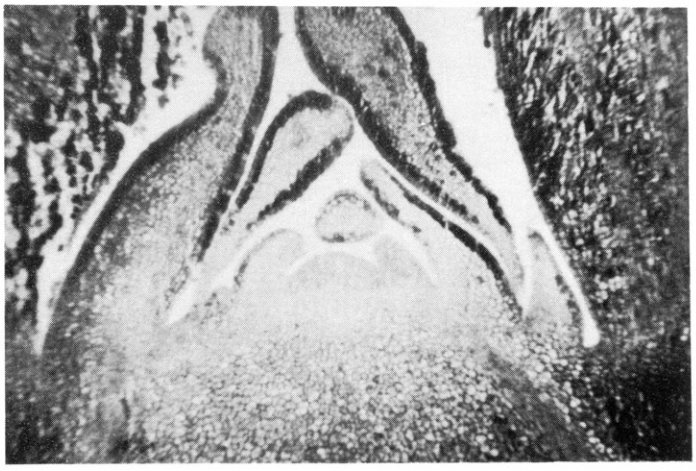

Fig. 1. Vegetative bud of 'Roseum Elegans' rhododendron on June 14, 4 weeks after pinching (100×).

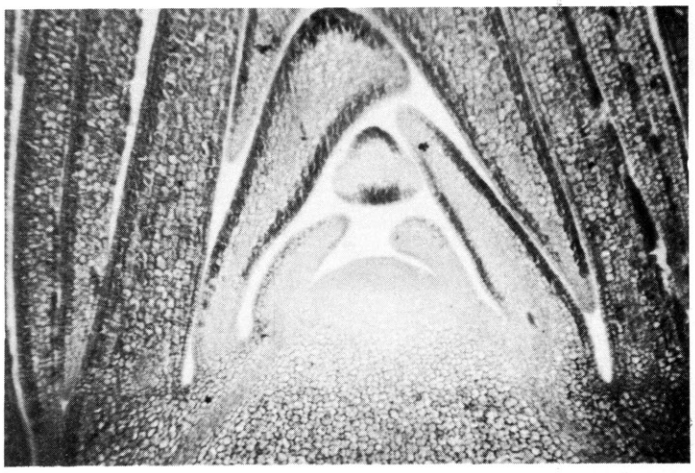

Fig. 2. Bud of 'Roseum Elegans' rhododendron on August 1, 10 weeks after pinching, showing evidence of floral initiation (100×).

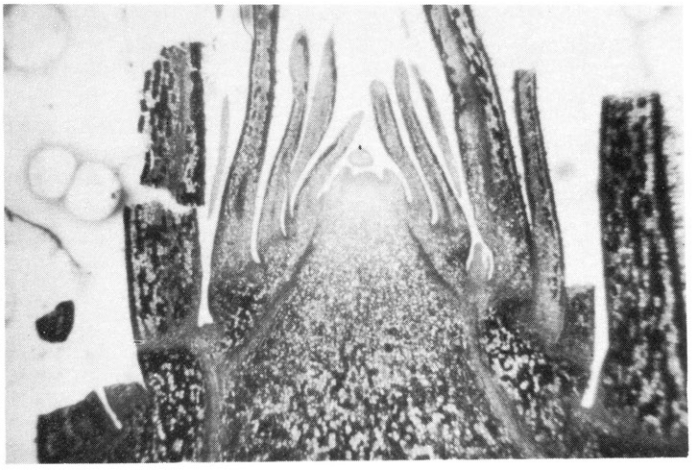

Fig. 3. Early floral development in a bud of 'Roseum Elegans. rhododendron on August 15, 12 weeks after pinching (100×).

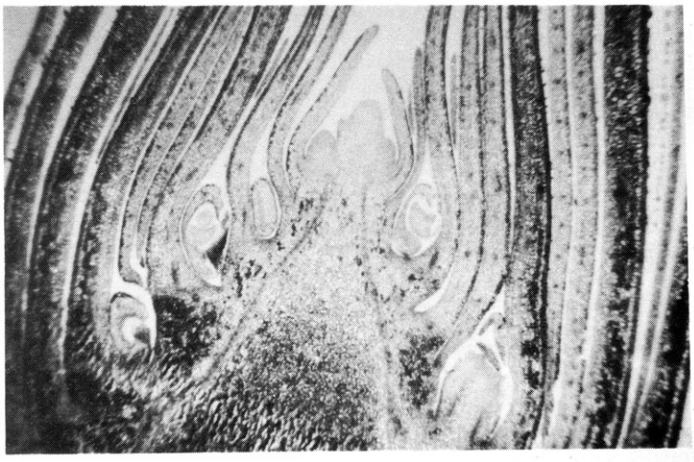

Fig. 4. Floral development in a bud of 'Roseum Elegans' rhododendron on September 1, 14 weeks after pinching (100×).

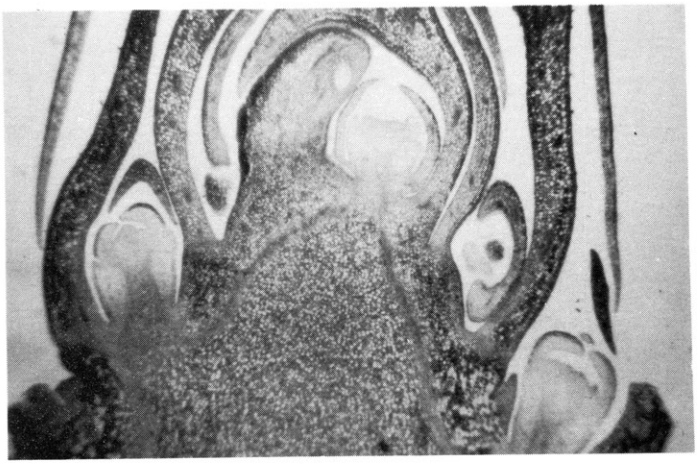

Fig. 5. Development of floral parts in a bud of 'Roseum Elegans' rhododendron on September 15, 16 weeks after pinching (100×).

Fig. 6. A flower bud of 'Roseum Elegans' rhododendron at winter rest on October 1, 18 weeks after pinching (100×).

Table 1. The number of breaks, growth in length, and percentage of breaks forming flower buds for 3 rhododendron cultivars pinched at 2 week intervals, June 14 to October 15.

Dates	Avg number of breaks/pinch	Avg growth per break (cm)	Breaks with flower buds (%)
May 14 (All plants cut back)	1.00	9.80	44.0
June 14 (repinched)	1.33	2.80	50.0
July 1 "	1.20	3.50	54.5
July 15 "	0.86	3.00	12.5
Aug. 1 "	2.00	4.00	55.5
Aug. 15 "	1.86	5.50	5.8
Sept. 1 "	1.33	2.80	0.0
Sept. 15 "	0.76	1.10	0.0
Oct. 1 "	0.43	0.80	0.0
Oct. 15 "	0.10	0.30	0.0
LSD 5%	0.51	2.00	

(Fig. 2). No floral parts were yet visible. On August 15 (12 weeks after pinching) the length of the apical meristem had increased and floral primordia were evident in the axis of leaf primordia (Fig. 3). On September 1 (14 weeks after pinching) the primary meristem continued to enlarge and elongate along with the floral primorida (Fig. 4). On September 15 (16 weeks after pinching) the first floral part was evident, the calyx (Fig. 5). Floral parts continued to form in the order of calyx, corolla, anthers and pistil. On October 1 (18 weeks after pinching) the parts of each floret continued to increase in size and complexity (Fig. 6). The pistil elongated and became longer than the anthers.

At the time of rest, all floral parts were highly developed and were surrounded by leaf-like cataphylls. The cataphylls are shed at anthesis.

Effects of pinching dates. In November, the 3 tagged shoots on each plant, which had their terminal buds removed for determination of floral development, were examined. The breaks were counted and measured and the number of flower buds determined.

Shoot growth was greatest in plants cut back on May 14 (Table 1). Shoots averaged 9.8 cm in length. Plants pinched again on June 14 to August 15 averaged 3.6 cm of new growth. Plants repinched after September 15 showed little new growth. Growth of all 3 cultivars was quite similar.

Plants pinched on August 1 and 15 averaged more breaks per inch than plants pinched earlier or later (Table 1).

Pinching also influenced the formation of flower buds. Plants pinched prior to August 1 (excepting the July 15 date) formed flower buds on about 50% of the shoots (Table 1). Plants pinched on August 1 formed a total of 18 shoots and 10 flower buds (54%). Plants pinched on August 15 formed flower buds on only 5.8% of the breaks and the plants pinched after August 15 failed to form any flower buds (Table 1).

Discussion

Floral induction, as evidenced by a broadening of the primary meristem, occurred in buds of 'Chionoides' on July 15 and in 'Roseum Elegans' and 'Nova Zembla' on August 1 under field conditions in Delaware. This was 8 weeks and 10 weeks, respectively, after the plants were cut back, which is more than double the time observed for forced greenhouse plants in Oregon by Adams and Roberts (1).

Plants pinched before the flower buds were starting to develop produced fewer breaks than those pinched after the flower buds were in advanced stages of development. In Delaware, plants pinched after August 1 had insufficient time to develop flower buds before the end of the growing season. The low number of flower buds obtained on the July 15 pinch (12.5%), which was counter to the overall results, is attributed to the influence of individual plants in a small sample.

This suggests that plants to receive 2 pinches should have a pinching schedule that allows 10 weeks between the first and second pinching dates with the second pinch completed by August 1. Perhaps an earlier cut back date than May 14 would be advantageous to allow final pinching between July 15 and August 1. This schedule should result in the maximum number of breaks per pinch accompanied by a favorable number of flower buds formed on the resulting breaks.

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