Effect of Terminal Bud Removal and Exogenous Indole Butyric Acid Treatments on the Rooting of Vegetative Rhododendron Cuttings

B.C. Strik[1] and C.J. French[2]

Agriculture Canada
Saanichton Research & Plant Quarantine Station
8801 East Saanich Road
Sidney, British Columbia
V3L 1H3
Canada

Many factors influence the rooting of rhododendron stem cuttings, including photoperiod (3), the application of exogenous growth substances (4) and water stress (5). Removal of the terminal bud during preparation of the cuttings was reported to improve rooting in *Rhododendron* 'English Roseum' (6) and has been suggested as of general importance in the propagation of rhododendron hybrids (Wells, unpublished observations). In contrast, no effect of terminal bud removal on the rooting of vegetative stem cuttings was found in *R.* 'Pink Pearl' (1).

In view of the uncertainty regarding this technique, the present study was conducted to investigate the effects of terminal bud removal combined with two standard exogenous treatments with indole butyric acid (IBA) on the rooting of four rhododendron cultivars ('Unique', 'Elizabeth', 'Anna Rose Whitney' and 'Vulcan').

[1]Present address:
Department of Horticultural Science,
University of Guelph,
Guelph, Ontario
N1G 2W1
Canada

[2]To whom correspondence should be addressed.

Materials and Methods:

Vegetative stem cuttings were taken from the current year's growth on field-grown, 15-year-old stock plants. Terminal cuttings were used for 'Elizabeth', 'Anna Rose Whitney' and 'Unique'; lateral cuttings were used for 'Vulcan' because few terminal cuttings could be taken. Lower leaves and lateral buds were removed. Four apical leaves and their associated axillary buds were retained, leaves being trimmed by approximately one-third to give equal leaf areas. The stem was shortened to 7 cm and wounded by removing a strip of bark from the basal 2.5 cm of one side of the stem. Two standard exogenous growth substance treatments were employed; 0.8% IBA in talc and 0.4% IBA in 95% ethanol. The control cuttings received no exogenous IBA. In each of these treatments, the terminal bud and underlying meristem were excised from one-half of the cuttings using a narrow-bladed scalpel. Care was taken not to damage the lateral buds associated with the apical rosette of leaves.

Powdered hormone was applied by dipping the cutting to the depth of the wound and shaking gently to remove the excess. IBA in ethanol was applied by dipping the stem base to a depth of 1 cm for 5 sec., followed by air drying before insertion into the rooting medium.

'Unique' cuttings were taken June 29, 1982 and propagated under mist in a glass greenhouse, shaded to reduce natural light intensity to 50%. The propagating medium used was sphagnum peat;perlite (1:8 v/v) maintained at 24 ± 0.9°C by thermostatically controlled electric warming cables. Misting was from 0400 to 2000 hrs, 5 sec/5 min. Air temperature ranged from a mean minimum of 18 ± 2°C to a maximum of 27 ± 3°C.

'Vulcan', 'Anna Rose Whitney' and 'Elizabeth' cuttings were taken September 11-13, 1982 and propagated in a wood-framed shadehouse with polyethylene-lined, wire-mesh walls and a fiberglass roof allowing 20% light transmission. The propagating medium used was peat:perlite (1:1 v/v) maintained at 20 ± 1.0°C. Misting was from sunrise to sunset, 5 sec/15 mins. Minimum and maximum air temperatures were, respectively, 6 ± 3°C and 16 ± 6°C.

Five cuttings were used for each of the six treatments and each treatment was replicated 8 times. A complete randomized block design was utilized.

Rooting was assessed after three months, except for 'Anna Rose Whitney' (four months). Percent rooted and mean root ball diameter (RBD) were recorded as well as a rooting

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score as follows:

0 — dead
1 — no roots and no callus formation
2 — no roots but with callus formation
3 — 1-4 single roots
4 — mean RBD 1.5 - 3.0 cm
5 — mean RBD 3.0 - 5.0 cm
6 — mean RBD 5.0 cm

The data was analysed by a 2 x 2 factorial analysis of variance (terminal bud removal and exogenous IBA as main effects), followed by single degree of freedom comparisons, where appropriate (7).

Results:

Exogenous IBA, supplied in powdered form, promoted rooting in all cultivars studied (Table 1). This is in agreement with previous reports (4). The 'quick-dip' method of IBA application also stimulated rooting to a comparable extent in 'Anna Rose Whitney', 'Elizabeth' and 'Unique', but had no effect on 'Vulcan' (Table 2).

The effects of terminal bud removal were variable, depending on the cultivar and IBA treatment.

IBA in talc (Table 1):

In 'Unique', terminal bud excision had no effect on rooting, either with or without application of IBA. In contrast, disbudding reduced root development in 'Vulcan' as judged by both root score and mean root ball diameter. Terminal bud excision also slightly inhibited rooting in 'Elizabeth'. Percent rooted was increased by bud excision in 'Anna Rose Whitney'. Root growth in this cultivar was unaffected.

Liquid IBA (Table 2):

No effect of terminal bud removal on rooting was observed in 'Unique' or 'Vulcan'. In 'Elizabeth', inhibition was noted together with an interaction between hormone treatment and disbudding. Terminal bud removal was inhibiting only in the absence of exogenous IBA. This indicates that the exogenous growth substance reversed the inhibition caused by disbudding. Percent rooted, root ball diameter and rooting score were improved by terminal bud removal in 'Anna Rose Whitney'.

Discussion:

The results indicate that the effects of terminal bud removal on the rooting of rhododendron cuttings depend on (a) the cultivar, and (b) the application of exogenous hormone. Terminal bud removal stimulated rooting in 'Anna Rose Whitney'. This suggests that the dormant vegetative bud in this cultivar produced a rooting inhibitor. Excision of the bud thus removes this inhibition. Such inhibitors have been implicated in rooting studies with other species; for example, Fadl and Hartmann's (2) work with pear hardwood cuttings. In 'Elizabeth', rooting was reduced by terminal bud removal and the effect was reversed by the application of exogenous IBA. This result may be interpreted as follows; the resting bud produces significant amounts of endogenous rooting hormone, removal thus inhibits rooting; normal rooting may be restored by applying exogenous hormone to the cutting base. In 'Vulcan', disbudding caused a slight inhibition of rooting was observed when the hormone was supplied as 0.8% IBA in talc. Apparently this inhibition was unrelated to hormone levels, since the application of exogenous IBA failed to reverse the inhibition in those cuttings with the terminal bud removed. The liquid hormone treatment failed to stimulate rooting in this cultivar; possibly more concentrated IBA may be required. The application of hormone as either liquid or powder stimulated rooting in 'Unique', in which no effect of disbudding was observed.

The results serve to emphasize the

Table 1: The effect of terminal bud removal in combination with exogenous IBA (0.8% in talc) on the rooting performance of rhododendron cuttings.

	With IBA		Without IBA		Standard error of means	Level of Significance		
Cultivar: Parameter	[z]TB intact	TB removed	TB intact	TB removed		IBA	TB removal	IBA[x] TB removal
Anna Rose Whitney:								
Percent Rooted	75	85	23	48	±7.8	y*	*	N.S.
Rooting Score	4.3	4.7	2.2	2.9	±0.3	*	[x]N.S.	N.S.
RBD (cm)	5.8	5.4	0.9	1.9	±0.5	*	N.S.	N.S.
Vulcan:								
Percent Rooted	93	83	58	53	±9.1	*	N.S.	N.S.
Rooting Score	5.1	3.8	2.8	2.5	±0.3	*	*	N.S.
RBD (cm)	4.8	2.8	1.2	0.7	±0.5	*	*	N.S.
Elizabeth:								
Percent Rooted	95	98	98	98	±2.7	N.S.	N.S.	N.S.
Rooting Score	5.5	5.6	5.1	4.8	±0.2	*	N.S.	N.S.
RBD (cm)	7.0	6.5	5.7	4.0	±0.5	*	*	N.S.
Unique:								
Percent Rooted	98	98	65	60	±7.0	*	N.S.	N.S.
Rooting Score	4.3	4.2	2.9	3.0	±0.2	*	N.S.	N.S.
RBD (cm)	2.7	2.6	0.8	0.9	±0.3	*	N.S.	N.S.

[z]TB — Terminal Bud [y] — significant at 5% level [x]N.S. — non-significant at 5% level.

Table 2: The effect of terminal bud removal in combination with exogenous IBA (0.4% in 95% Ethanol) on the rooting performance of rhododendron cuttings.

Cultivar: Parameter	With IBA		Without IBA		Standard error of means	Level of Significance		
	[z]TB intact	TB removed	TB intact	TB removed		IBA	TB removal	IBA[x] TB removal
Anna Rose Whitney:								
Percent Rooted	78	88	23	48	±7.1	y*	*	N.S.
Rooting Score	4.0	4.6	2.2	2.9	±0.3	*	*	N.S.
RBD (cm)	3.9	5.2	0.9	1.9	±0.5	*	*	N.S.
Vulcan:								
Percent Rooted	60	43	58	53	±9.5	[x]N.S.	N.S.	N.S.
Rooting Score	3.0	2.5	2.8	2.5	±0.2	N.S.	N.S.	N.S.
RBD (cm)	1.2	0.7	1.2	0.7	±0.3	N.S.	N.S.	N.S.
Elizabeth:								
Percent Rooted	95	95	98	98	±3.4	N.S.	N.S.	N.S.
Rooting Score	5.2	5.3	5.1	4.8	±0.2	N.S.	N.S.	N.S.
RBD (cm)	5.7	6.3	5.7	4.0	±0.4	*	N.S.	*
Unique:								
Percent Rooted	88	93	65	60	±7.9	*	N.S.	N.S.
Rooting Score	4.1	4.0	2.9	3.0	±0.2	*	N.S.	N.S.
RBD (cm)	2.8	2.3	0.8	0.9	±0.3	*	N.S.	N.S.

[z]TB — Terminal Bud [y] — significant at 5% level [x]N.S. — non-significant at 5% level.

diversity of rhododendron cultivars regarding their response to various factors affecting rooting. No general benefits of terminal bud removal were apparent although the slowest rooting cultivar, 'Anna Rose Whitney', showed a positive response. Possibly in the more difficult-to-root rhododendrons there is a rooting inhibitor present. Thus in these cultivars, rooting would be promoted by terminal bud excision.

At this time, it is doubtful that removal of the vegetative terminal bud is of general benefit in rooting stem cuttings of *Rhododendron.*

Summary

The effect of terminal bud removal on the rooting of four cultivars of *Rhododendron* ('Unique', 'Vulcan', 'Elizabeth' and 'Anna Rose Whitney') was investigated. No effect of disbudding was found in 'Unique'. In 'Vulcan' and 'Elizabeth' terminal bud removal reduced root growth. In 'Elizabeth' this inhibition could be reversed by the exogenous application of IBA. Root development and percent rooted was improved by terminal bud excision in 'Anna Rose Whitney'. The effects of terminal bud removal were found to depend on the cultivar and the exogenous application of hormone.

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1985 ANNUAL MEETING

Eddie Newcomb, Annual Meeting Chairman, reports that the 1985 Annual Meeting will be held May 2, 3, 4 & 5, 1985, at the Bellevue Red Lion Inn, 300 112th Ave. SE, Bellevue, WA 98004, (206)455-1300.

AS YOU SOW

Austin C. Kennell, Afton, Va.

There's not a whole lot of difference in growing healthy, happy plants and developing a vigorous, responsive ARS chapter. The same ingredients — interest, care, and effort — are just about all that are necessary for success in either case.

The Middle Atlantic Chapter is a healthy, purposeful chapter. Sure, we're prejudiced; but we believe we have the finest people, the most interesting meetings and the best member benefits of any chapter in the ARS. An idle boast? Well, maybe, but how else do you account for the fact that our 1983 fall meeting drew over 160 people from distances up to 250 miles who paid over $22.00 each out of their own pocket for a one-day meeting plus paying for one night, and in some cases, two nights lodging! Many also donated plants, served in various volunteer capacities, brought guests, hauled in meeting materials, and spent many hours planning the meeting.

What makes a good chapter? Well, here are some of the things that make the M.A.C. a great chapter:

Meetings are held in different places in the M.A.C. area.

Meetings are designed to be interesting both to the experienced and the novice.

A yearly Plants for Members program whereby rooted cuttings of rare and unusual plants are propagated by members and sold to members at very nominal prices.

An annual plant auction of plants donated by members.

Periodic special offerings of plants owned and propagated by the chapter.

An outstanding newsletter issued four times a year featuring articles by and about members, growing tips, source information, a "wanted" column, etc.

Ratings of plants grown in the M.A.C. area.

Joint meetings with our District Nine in-laws — the Potomac Valley and Mason-Dixon chapters; the Azalea Society of America, and other organizations.

An emphasis on azaleas — evergreen, deciduous, and natives as well as rhododendrons.

Very short business meetings. Maximum socializing time.

Special attention is given to new members including a letter of welcome, an activities and service list; an interest questionnaire; a list of area plant sources; special identification at meetings; and various occasional programs such as free plants, free cuttings and seeds, and credit to use at plant auctions.

Garden tours of members' gardens and nurseries.

Special meeting attractions such as a box lunch in a garden, a Hawaiian luau buffet around a hotel swimming pool, sharing ten-foot submarine sandwiches, seafood at the shore, wine and cheese in a garden setting, coffee and rolls for early arrivals, dessert social for members arriving the evening before, door prizes, visits to unusual places, special discounts at nurseries visited, etc.

An annual Flower Show with attractive useful trophies.

A close relationship with the outstanding Plant Pathology Department of Virginia Tech University.

A dedicated, enthusiastic and responsive Board of Directors.

The diversity of three different climate zones.

A Chapter Document Repository serving as an archives for chapter records, correspondence and publications at the Alderman Library of the University of Virginia.

A healthy, growing treasury built largely by various fund-producing activities.

A good blend of commercial growers, garden nurserymen, amateur hobbyists, and new, eager beginners providing a wide variety of talents and interests.

And, most important of all, a willingness to share and help.

Since we believe you should aim higher than your reach, we've got a lot of other things on the drawing board — problem hot lines; hosting the 1988 ARS convention in Williamsburg, Va.; greater cooperation with the other District Nine chapters; group tours to areas outside the M.A.C. home grounds; chapter or district test garden(s); new member buddy system; and other possible activities and services.

In the M.A.C., we've found out that as you sow, so shall you reap. All it takes is interest, care, and effort!

FERTILIZER INJURY

Rhododendrons have fine roots that grow very close to the soil surface. It is easy to burn the roots with fertilizer. Several light applications during spring and summer are better than one heavy application. Spread the fertilizer around the drip-line of the foliage.