Effect of Localized Etiolation of Stock Plants on the Rooting of *Rhododendron* Cuttings[1]

Tim D. Davis[2] and John R. Potter[3]
USDA-ARS, Horticultural Crops Research Laboratory
3420 N.W. Orchard Ave., Corvallis, OR 97330

Abstract

The basal portions (excluding leaves) of newly expanding shoots on stock plants of 11 *Rhododendron* cultivars were wrapped with aluminum foil to exclude light. After 11 to 14 weeks, cuttings were made by severing the shoots just above the base of the etiolated region. For 2 cultivars ('Corsage' and 'Ramapo'), this localized etiolation of stock plants accelerated the development of adventitious roots and decreased the time to obtain well-rooted cuttings.

Index words: light, adventitious root formation, propagation

Introduction

Etiolation has been used successfully as a preseverance treatment of stock plants to increase subsequent rooting of cuttings in a number of different species (1, 2, 3, 4). Rooting of *Rhododendron* cuttings may be affected by light incident on the stems, because continuous light during the *in vitro* culture of *Rhododendron* stem explants inhibited rooting, while culture in darkness promoted rooting (7, 8). In addition, dense shading of *Rhododendron* stock plants increased rooting of leaf petiole cuttings (5). The present investigation was undertaken to determine if localized etiolation of *Rhododendron* stock plants had an effect on the rooting of cuttings.

Materials and Methods

In May and June of 1980, stems of 11 *Rhododendron* cultivars were wrapped with aluminum foil from the base of the current season's growth to the first leaf node. For each cultivar, wrapping took place after bud break as soon as it was possible to cover the elongating herbaceous stems. Table 1 gives the treatment details for each of the 11 cultivars. All cultivars were grown in full sun except 'Coral Bells' which was grown in the shade of a north facing wall. At the time of excision, the shoots, which were semi-woody and had ceased elongating, were severed just above the base of the etiolated region. The shoots were given a basal dip of 0.3% indole-3-butyric acid (IBA) in an inert powder carrier (Hormodin 2) and rooted in a peat-perlite medium (1:1 by volume) without bottom heat under intermittent mist in a greenhouse. Unwrapped shoots were treated in the same manner and served as controls. Day/night temperatures during rooting were about 25/20 °C (77/68 °F) and maximum photosynthetic photon flux density was about 300 uE•m^{-2}•s^{-1} (approx. 1500 foot-candles). Root development was monitored by periodic examination of several cuttings from each treatment/cultivar, and root development was recorded after most of the cuttings in a treatment/cultivar had rooted or after the slow-to-root cuttings began to deteriorate. For 'Ramapo' and 'Corsage' the experiment was repeated in 1981, except that rooting was evaluated after 5 and 13 weeks. Both cultivars were wrapped on May 6 using the same amount of foil as used in 1980, and cuttings were excised on August 3. Rootball diameter was the average distance across the rootball when the rooted cutting was lifted from the rooting medium, and rootball depth was the distance downward to which the rootball penetrated the rooting medium.

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[2]Former Research Assistant, Department of Horticulture, Oregon State University, Corvallis, OR 97331; presently, Assistant Professor of Horticulture, Department of Agronomy and Horticulture, Brigham Young University, Provo, UT 84602.

[3]Research Plant Physiologist.

Table 1. Treatment details for localized etiolation of stock plants of 11 *Rhododendron* cultivars in 1980.

Cultivar	Length of shoot wrapped (cm)	Date wrapped	Date excised	Duration of rooting period (weeks)
Corsage	2-3	May 2	Aug. 6	5
Ramapo	1-2	May 9	Aug. 6	5
Martha Hitchcock	2-4	May 14	Aug. 8	4
Parsons Gloriosum	5-9	May 16	Aug. 11	17
Unique	4-5	May 16	Aug. 11	22
Coral Bells	2-4	May 26	Aug. 15	5
Jean Marie de Montague	7-10	June 6	Sept. 8	35
Blue Ensign	4-8	June 11	Sept. 9	26
Caroline	4-8	June 11	Sept. 9	22
Roseum Elegans	3-6	June 23	Sept. 10	13
Sappho	3-8	June 23	Sept. 10	17

Table 2. Effects of localized etiolation of stock plants on the rooting of 11 *Rhododendron* cultivars. Rootball diameter and depth means were calculated considering only rooted cuttings.[z]

Cultivar/treatment	Sample size	Rooting parameter: % rooting	Rootball diameter (cm)	Rootball depth (cm)
'Corsage'				
control, 1980	25	48	0.9 ± .28	1.2 ± .34
etiolated, 1980	25	80[y]	1.2 ± .25	1.3 ± .30
control, 1981	30			
after 5 weeks		20	0.6 ± .33	0.7 ± .41
after 13 weeks		93	not obtained	not obtained
etiolated, 1981	30			
after 5 weeks		37	1.4 ± .30	1.4 ± .28
after 13 weeks		86	not obtained	not obtained
'Ramapo'				
control, 1980	28	50	0.2 ± .09	0.3 ± .13
etiolated, 1980	28	93[y]	0.7 ± .10	0.8 ± .13
control, 1981	37			
after 5 weeks		59	0.6 ± .14	0.6 ± .12
after 13 weeks		100	not obtained	not obtained
etiolated, 1981	37			
after 5 weeks		89[y]	1.6 ± .18	1.4 ± .15
after 13 weeks		97	not obtained	not obtained
'Martha Hitchcock'				
control	15	100	1.4 ± .29	1.5 ± .27
etiolated	15	93	1.7 ± .34	1.6 ± .31
'Parsons Gloriosum'				
control	10	90	3.4 ± .46	rootballs reached bottom
etiolated	10	100	3.3 ± .58	of flat in both treatments
'Unique'				
control	15	67	2.9 ± .52	rootballs reached bottom
etiolated	15	73	2.1 ± .43	of flat in both treatments
'Coral Bells'				
control	16	100	1.7 ± .12	1.8 ± .17
etiolated	16	100	2.1 ± .15	1.7 ± .17
'Jean Marie de Montague'				
control	10	all cuttings poorly rooted regardless of treatment		
etiolated	10			
'Blue Ensign'				
control	23	9		poorly formed rootballs
etiolated	23	9		in both treatments
'Caroline'				
control	16	69	1.9 ± .46	rootballs reached bottom
etiolated	16	63	1.7 ± .26	of flat in both treatments
'Roseum Elegans'				
control	19	89	2.7 ± .32	rootballs reached bottom
etiolated	19	95	2.3 ± .26	of flat in both treatments
'Sappho'				
control	10	90	3.7 ± .48	rootballs reached bottom
etiolated	10	60	4.8 ± .91	of flat in both treatments

[z] ± values indicate standard error of the mean.

[y] Etiolated treatment rooting percentage significantly higher than corresponding control rooting percentage at the 5% level of probability.

Results and Discussion

Localized etiolation of stem bases increased early rooting percentages of only 2 of the 11 cultivars. Etiolation increased the rooting percentage at 5 weeks of 'Ramapo' from 50 to 93% in 1980 and from 59 to 89% in 1981, and it increased the rooting percentage of 'Corsage' from 48 to 80% in 1980 and from 20 to 37% in 1981 (Table 2). The reason for the relatively poor rooting of 5 week-old 'Corsage' cuttings in 1981 is unknown. Etiolation reduced the time required to form roots rather than influencing the long term rooting capacity of cuttings, because after 13 weeks on the cutting bench in 1981, etiolation had no effect on the rooting percentage.

At 5 weeks the rootball size of 'Ramapo' and 'Corsage' cuttings was also enhanced by localized etiolation (Table 2). Rootball diameter and depth of 'Ramapo' cuttings were 2 or 3 times greater in the etiolated treatments than in the controls in both years, probably due to the ease of rooting of the etiolated cuttings. Differences in rootball size were less pronounced in 'Corsage' cuttings but were still evident in the 1981 data. Rootball diameters at 13 weeks were not obtained because the root systems were intertwined. Rootball size of cuttings from the other 9 cultivars was not affected by etiolation.

The mode by which localized etiolation of the stock plants increased rooting of 'Ramapo' and 'Corsage' cuttings is not known. It has been suggested that etiolation improves rooting by increasing the herbaceous nature of the rooting region (1). Herman and Hess (4) reported that etiolated stems were relatively herbaceous because they had thinner cell walls, more parenchyma cells, and more undifferentiated tissue than stems which developed in the light. In the present investigation, wrapping the basal portion of the shoots resulted in a whitish band of tissue characteristic of etiolation. This band was especially apparent on 'Ramapo,' the cultivar showing the greatest treatment effect. Etiolation may also increase the auxin content of stems and thereby enhance rooting (4, 6). Because our cuttings were treated with exogenous auxin, it is questionable whether or not endogenous auxin greatly influenced our observations.

Significance to the Nursery Industry

While wrapping stems with aluminum foil is a labor-intensive procedure, it significantly decreased the time to obtain well-rooted cuttings of the *Rhododendron* cultivars of 'Ramapo' and 'Corsage.' However, the rooting of 9 other *Rhododendron* cultivars was not affected by localized etiolation.

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