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PRE-EMERGENT HERBICIDE EFFECT ON THE ROOTING OF CUTTINGS

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Abstract. Unrooted cuttings of *Rhododendron obtusum* 'Hino Crimson', *Euonymus fortunei* 'Emerald Gaiety', *Ilex crenata* 'Helleri', and *Cotoneaster horizontalis* were treated with Dual, Devrinol, Ronstar, Surflan, and Rout. Cuttings were then allowed to root under intermittent mist in a polyethylene greenhouse, and were later evaluated for rooting percentage and rooting quality. When compared to the untreated check, results indicated no significant difference with the use of Ronstar as a pre-rooting herbicide treatment for *R. obtusum* 'Hino Crimson', *E. fortunei,* and *I. crenata*. Likewise, Rout showed similar results for *R. obtusum* 'Hino Crimson' and *E. fortunei* 'Emerald Gaiety'. All other herbicide treatments demonstrated poorer results of either percentage or quality of rooting on the species tested.

REVIEW OF LITERATURE

In southern New Jersey, many growers of woody nursery stock root their cuttings in outdoor beds or in open greenhouses. Each year, from grower experience, weed seeds apparently are blown onto the rooting medium and cause subsequent expenses in hand weeding. The weed growth also results in reduced growth of the cuttings through competition and/or mechanical disruption during the weeding process. A previous study indicated some potential for using several pre-emergent herbicides during the rooting phase of cuttings. This study was initiated to further determine the potential for using pre-emergent herbicides as weed control agents on unrooted cuttings, while examining their effect on rooting ability and quality of rooting.

MATERIALS AND METHODS

Cuttings from four species; *Rhododendron obtusum* 'Hino Crimson' (Hino Crimson azalea), *Euonymus fortunei* 'Emerald Gaiety', *Ilex crenata* 'Helleri', and *Cotoneaster horizontalis* were taken on July 24, 1986. A quick-dip hormone (Dip 'n' Grow diluted 10:1 for *Ilex* and 20:1 for all other species) was used on the cuttings which were stuck in 3 × 3 × 3.5 in., #18 cell trays. The medium was a mix of peat:vermiculite:perlite:sand (70:10:10:10, v/v/v/v), and

contained 5 lb of dolomitic lime, 1.25 lb of 0-46-0, 0.5 lb of 0-0-60, 3 oz of fritted trace elements, and 1.5 pt of a granular wetting agent per yd.[3] Cuttings were misted with low volume (0.45 gpm) sprinklers on a time clock system after being treated with the herbicides on the date of propagation.

All treatments were replicated nine times. Treatments included: an untreated check, Dual (80EC) at 4 lb ai/acre, Devrinol (10G) at 3 lb ai/acre, Ronstar (50WP) at 4 lb ai/acre, Surflan (75WP) at 3 lb ai/acre, and Rout (3G) at 100 lb ai/acre (Surflan at 1 lb ai/acre plus Goal at 2 lb ai/acre). Herbicides were applied on a sunny day with a temperature of 90°F and a relative humidity of 66%. After the treated cuttings had dried, all cuttings were watered heavily. Evaluation of the cuttings was based on a 1 to 9 quality rating system (1 = unrooted, 9 = best rooting) on October 9, 1986. Cuttings were also checked for rooting percentage. Analysis was conducted within species and is reported as the least significant difference at the 5% confidence level.

RESULTS AND DISCUSSION

Evaluation for rooting percentage indicated the untreated cuttings were either the best treatment or were not significantly different from the best treatments (Table 1). In both the azalea and cotoneaster treatments, cutting rooting percentage was reduced by Surflan. Additionally, rooting percentage of cotoneaster was reduced by Dual, and Devrinol. There was no reduction of rooting percentage with any treatment for either *Ilex* or *Euonymus*.

Table 1. Rooting percentage of cuttings by species with various treatments.[1]

Treatment	Species			
	Rhododendron	*Ilex*	*Euonymus*	*Cotoneaster*
Untreated	78ab[2]	100	100	100a
Dual	67b	100	100	33d
Devrinol	100a	100	100	78c
Ronstar	89ab	100	100	100a
Surflan	22c	100	100	89b
Rout	78ab	100	100	100a

[1] Evaluated October 9, 1986.

[2] *Percent rooting. Figures in the same column followed by the same letter are not significantly different at the* 0.05 level.

The evaluation for rooting quality again indicated that no treatment was significantly better than the untreated check (Table 2). In azalea, *Ilex*, and *Euonymus*, the Ronstar treatment was not significantly different from the check. Other treatments not significantly different from the checks were Devrinol and Rout on azalea, and Rout on *Euonymus*. It is interesting to note that no treatment performed as well as the untreated check on cotoneaster which was the only deciduous species in the experiment.

Table 2. Rooting quality of cuttings by species with various treatments.[1]

Treatment	Species			
	Rhododendron	*Ilex*	*Euonymus*	*Cotoneaster*
Untreated	4.11a[2]	7.44a	8.44a	6.67a
Dual	1.67b	3.44c	3.89c	1.56d
Devrinol	3.44a	5.00b	4.00c	4.00c
Ronstar	4.56a	7.44a	8.89a	4.67bc
Surflan	1.33b	3.44c	7.56b	4.33bc
Rout	3.67a	5.44b	8.78a	5.11b

[1] Evaluated October 9, 1986.
[2] Rooting quality based on a 1–9 scale (9 = best). Numericial ratings in the same column followed by the same letter are not significantly different at the 0.05 level.

A review of the results by herbicide reflected the activity of each herbicide (1). Dual has limited soil mobility, and has season-long residual activity. It inhibits root elongation, and resulted in a reduction of the rooting quality in all species. In *Ilex*, roots were gnarled and restricted close to the cutting shoot. In the other species, root density was generally reduced. Rooting percentage was reduced in azalea and cotoneaster, but not in *Ilex* and *Euonymus*. Both azalea and cotoneaster have more succulent leaves which could absorb far greater quantities of herbicide than the waxy leaves of the *Ilex* and *Euonymus*. Translocation of the herbicide could have caused the reduction in rooting percentage in those two species. The quality of rooting might result from Dual being absorbed through newly emerged roots and then inhibiting subsequent root activity.

Devrinol is taken up by the roots and has a long residual in the soil. Inhibition was primarily in rooting quality and not in rooting percentage. Roots apparently are initiated, absorb the herbicide, and are then injured. The results are bulbous roots in azalea, and root restriction close to the medium surface in *Ilex* and *Euonymus*. Devrinol has limited soil mobility in the peat-based medium which was demonstrated by injury to the roots which did not extend more than ½ in. below the medium surface.

Ronstar is primarily a contact herbicide, although there is possible translocation in susceptible plants. Results in rooting percentage indicated no differences between the treated cuttings and the untreated check, which would be expected. Based on rooting quality, cotoneaster was the only species to exhibit any root inhibition, and resulted in reduced root density. Possibly cotoneaster leaves are sufficiently succulent to allow for foliar absorbtion and subsequent translocation of Ronstar which resulted in root inhibition.

Surflan affects physiological growth processes. It is absorbed by the roots, and has a full season residual in the soil. Inhibition of rooting percentage was noted in azalea and cotoneaster, while rooting quality was negatively affected across all species. The

severity of rooting percentage inhibition in azalea is interesting to note, and may be the result of susceptibility of that cultivar to Surflan. Also of interest was the ½ in. root restriction from the medium surface in *Ilex*, which was very similar to the restriction noted with Devrinol applied to *Ilex*.

Rout has the activity of Surflan at 1 lb ai/acre rate (instead of the normal 3 lb ai/acre rate) in combination with Goal, which is a contact herbicide, at the 2 lb ai/acre rate. Goal is not soil mobile. Rooting percentage was unaffected by this treatment, while a reduction in root quality was noted only in *Ilex* and cotoneaster. Both *Ilex* and cotoneaster were also the most affected species by Surflan alone and therefore the reduction in root quality may be attributed to the Surflan. *Ilex* had a notably looser root-ball with this treatment than in the untreated check.

CONCLUSIONS

When a weed problem occurs on a continuing basis, growers should first implement additional sanitation procedures. When those measures give less than desirable results, then the grower should evaluate the potential for using herbicides to control the problem. If success can be assured, the use of herbicides could prove to be a cost-effective alternative to hand-weeding. When rooting cuttings, however, the primary goal must remain that of success in rooting percentage and quality.

This study has indicated a potential for using Ronstar as a weed control agent for *R. obtusum* 'Hino Crimson', *E. fortunei* 'Emerald Gaiety', and *I. crenata* 'Helleri'. Although the rooting percentage of *C. horizontalis* was unaffected by Ronstar, the rooting quality was inhibited, and therefore should not be considered as a weed control agent on this species. Results of the Rout treatment also demonstrated the possibility of using that herbicide on *R. obtusum* 'Hino Crimson' and *E. fortunei* 'Emerald Gaiety'. All other herbicides tested did not exhibit consistent positive results, and should not be considered for use during the rooting of cuttings on the species tested. Further evaluation should be conducted to determine the potential for using these and other herbicides during the rooting phase of cuttings, and to demonstrate year-to-year replication of the Ronstar and Rout results.

LITERATURE CITED

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