Pre-emergent Herbicide Use in Propagation of *Loropetalum chinense* 'Ruby'

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ABSTRACT

Three herbicides were evaluated during propagation of *Loropetalum chinense* 'Ruby' to determine the effects on rooting and subsequent plant growth. Herbicides evaluated were: Gallery (isoxaben), Ronstar 2G (oxadiazon), and Regal O-O (oxyfluorfen + oxadiazon). Herbicides were applied at three separate times during the propagation process: before sticking, lightly rooted, or fully rooted. Before sticking treatments were applied to flats filled with standard medium prior to the cuttings being stuck. About one month later when roots had just begun to emerge (1-2 inches long), a separate group of cuttings (lightly rooted) were treated. Finally, the third application occurred to a separate group of cuttings (not previously treated) once the cuttings were fully rooted. Data was collected at 65, 248, and 342 days after sticking (DAS). One year after sticking, growth indices of 'Ruby' loropetalum were similar regardless of when Gallery was applied. At that time there was no effect on root coverage except when Gallery was applied before sticking, which had 58% root coverage compared to 69% for non-treated plants. With Ronstar and Regal O-O shoot growth was similar about one year later; however, root coverage was suppressed with Ronstar applied before sticking and at lightly rooted, while Regal O-O suppressed root coverage on all dates of application.

INTRODUCTION

Cuttings are propagated in small containers and previous research suggests weeds compete more for water, light, and nutrients in smaller containers than in larger containers (3). With herbicide restrictions, hand weeding is the major form of weed control in propagation but can suppress growth of cuttings through mechanical disruption (6). Another restriction with hand weeding is cost of labor. Gilliam et. al. 1990 estimated labor costs ranged from $246-$567/acre based on an average hourly wage of $3.53-$3.97 (5). In 2004, North Carolina's annual weeding labor costs ranged from $967-$2,228/acre based on an hourly wage of $14.75/hr (7).

There is a need for weed control options beyond hand weeding during propagation of nursery crops, especially with rising labor cost and potential labor shortages in the future. Most herbicides available for the nursery industry contain DNA herbicides, which are root inhibiting (2, 8). In previous research, Ronstar has been shown to cause no reduction in growth or root quality when applied during propagation of boxwood (9). In other work, Ronstar and Regal 0-0 were reported to cause no reduction in root quality of azalea or hollies during propagation (4). In more recent work, Altland et. al. showed Gallery to have post-emergent control of bittercress which is one of the major weeds in propagation (1). A post-emergent option for bittercress control in propagation would provide a needed option for nursery producers.

Evergreen nursery crops are frequently propagated in outside beds during the summer. These conditions are ideal for germination and growth of weed species. Eliminating these weed species during propagation will reduce future weed pressure in production areas and promote better crop growth. The objective of our study was to compare Ronstar and Regal O-O with Gallery for effects on rooting of 'Ruby' loropetalum when applied at different times during the propagation process.

MATERIALS AND METHODS

In this study three preemergence herbicides were applied to cuttings of *Loropetalum chinense* 'Ruby' at three different times in the rooting process. The objective of this study was to determine if three commonly used herbicides could be used safely during propagation of 'Ruby' loropetalum; Gallery, Ronstar and Regal 0-0.

Gallery at 1lb/aia, Ronstar at 4lb/aia, and Regal 0-0 at 3lb/aia were applied either before sticking (August 2, 2005), when cuttings were lightly rooted (September 18, 2005), or when cuttings were fully rooted (November 4, 2005). Terminal cuttings 2.76 to 3.54 inches (7 to 9 cm) were stuck on August 2, 2005, in 3.5 inch (8.89cm) containers utilizing a pinebark:sand 6:1 (v:v) medium amended with Polyon 17-6-12 @ 9lbs/yd^3, Micromax @ 1.5 lbs/yd^3, and dolomitic lime @ 5.0lbs/yd^3. Each cutting was dipped in Dip 'N' Grow 1part:5parts water (2000 ppm IBA) for 4 seconds prior to sticking. This study was a 3×3 factorial with 9 replications of 9 containers per replication in a completely randomized design.
With the before sticking treatment, propagation flats were treated one hour before cuttings were stuck and watered in with 0.25 inch of water. All pots were placed in outdoor cold frames with overhead mist every

five minutes for five seconds from 8 am to 7 pm. Thirty-eight days after sticking (DAS) September 8 a separate group of lightly rooted cuttings not previously treated were pulled from the mist beds prior to mist starting at 8:00 am, to allow treatment to dry foliage. Thereafter the foliage was lightly brushed off and plants watered in (0.25 inch) and returned to mist. On November 4 (94 DAS) the final treatment (fully rooted) was applied the same as the second treatment and plants were left under mist for one additional week before being moved to a retractable shade house for overwintering.

Data was collected 65, 248, and 342 DAS. At 65 DAS, shoot number per cutting and average length of three longest shoots were recorded for cuttings treated before sticking and lightly rooted. Four plants from each replication were randomly selected to determine number of primary roots, average length of three longest roots, and root fresh weight. After over-wintering April 7, 2006 (248 DAS) growth indices and percent root coverage of the propagation container (0-100 scale) were taken prior to potting in full gallon containers. Growth indices and percent root coverage of containers were taken again on July 10, 2006 (342 DAS).

RESULTS

65 DAS – *Before Sticking* – Gallery had no effect on shoot growth or root growth of 'Ruby' loropetalum (Table 1). Ronstar and Regal 0-0 suppressed shoot length by 44 and 37%, and root length by 30 and 16% compared to the non-treated control. *Lightly rooted* – Compared to the non-treated control plants there were no herbicide effects on new shoot number, shoot length, or root fresh weight (Table 1). Gallery and Ronstar had slightly less root numbers compared to Regal 0-0 and non-treated plants. Slight suppression in root length (less than 10%) occurred with Gallery and Regal 0-0 compared to the non-treated control with the exception of Ronstar.

248 DAS – *Before Sticking* – Gallery and Ronstar treated cuttings were similar but were smaller and had less root coverage than the non-treated control plants while Regal 0-0 caused severe reduction in growth indices (73%) and root coverage (74%) (Table 2). *Lightly Rooted* – 'Ruby' loropetalum treated when roots were 1-2 inches long were similar in size regardless of herbicide treatment (Table 2). Root ratings were slightly less for Ronstar and Regal 0-0 compared to the non-treated control; however, Gallery treated plants had similar rootball coverage as the non-treated plants. *Fully rooted* – A slight difference in new growth was observed for all plants treated with herbicides compared to the non-treated plants (Table

2). Fully rooted cuttings treated with Gallery and the non-treated plants had similar root ratings, while Ronstar and Regal 0-0 suppressed root ratings compared to the non-treated control cuttings with Regal 0-0 suppressing root growth more than Ronstar.

342 DAS – *Before Sticking* – Approximately one year after application all cuttings treated before sticking had similar growth indices regardless of herbicide treatment (Table 3). No difference in root coverage was observed among Gallery, and Ronstar but all herbicide treatments had less root coverage than the non-treated plants (Table 3). *Lightly rooted* – Plants from all herbicide treatments were similar in size or larger than the non-treated control plants when treated at the lightly rooted stage during propagation. Gallery applied to lightly rooted cuttings had similar root coverage compared to the non-treated control (Table 3). Ronstar and Regal 0-0 had less root coverage than the non-treated plants however Ronstar treated cuttings had equal root coverage to cuttings treated with Gallery. *Fully rooted* – There was no herbicide affects in percent root growth compared to the non-treated control with the exception of Regal 0-0 applied to fully rooted cuttings (Table 3). Gallery, Ronstar, and Regal 0-0 applied to fully rooted cuttings had similar growth indices compared to the non-treated control one year after propagation.

DISCUSSION

In summary Gallery applied to lightly or fully rooted cuttings did not cause any suppression in shoot or root growth. These data suggest that Gallery could be sprayed over-the-top of cuttings for post-emergence control of bittercress. Furthermore, application of Gallery before sticking did cause slight suppression of root growth compared to the non-treated cuttings; however, by the end of the first growing season, shoot growth was similar to non-treated plants. Cuttings treated with Ronstar and Regal 0-0 also had similar shoot growth to the non-treated cuttings by the end of the first year. Ronstar reduced root coverage when applied before sticking and when cuttings were lightly rooted, while Regal 0-0 reduced root coverage regardless of application timing. From a grower's point of view, use of herbicides in propagation which causes slight reductions in root coverage at the end of the first growing season may be more acceptable than dealing with weed pressure and added labor cost throughout the life of the crop.

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Table 1. The influence of herbicide application during propagation 65 days after sticking on *Loropetalum chinense* 'Ruby'

	Before Sticking[z]				Lightly Rooted[y]			
	Gallery	Ronstar	Regal 0-0	Control	Gallery	Ronstar	Regal 0-0	Control
Shoot Number[x]	3.6a[t]	1.3c	1.4c	3.0b	2.7a	2.7a	2.8a	3.0a
Shoot Length[w]	4.3a	2.3b	2.6b	4.1a	4.5b	3.8b	5.9a	4.1b
Root Number[v]	11.5ab	10.1bc	8.7c	12.6a	10.8b	10.5b	12.7a	12.6a
Root Length[u]	22.7a	15.4c	18.5b	22.0a	19.9b	21.4ab	19.8b	22.0a
Root Weight	0.6a	0.3b	0.4b	0.6a	0.6a	0.5a	0.5a	0.6a

[z] Before Sticking = herbicide prior to sticking cuttings

[y] Lightly Rooted = herbicide applied to lightly rooted cuttings (3-4 roots)

[x] Shoot Number = number of new shoots per rep

[w] Shoot Length = length of three longest shoots ÷ 3 (cm)

[v] Root Number = number of primary roots per replication

[u] Root Length = length of three longest roots ÷ 3 (cm)

[t] means (across columns within application times) with different letters are significantly different, according to Duncan'sMultiple Range test (α=0.05)

Table 2. The influence of herbicide application during propagation 248 days after sticking on *Loropetalum chinense* 'Ruby'

	GI[z]			Root Coverage[y]		
Herbicide	Before Sticking	Lightly Rooted	Fully Rooted	Before Sticking	Lightly Rooted	Fully Rooted
Gallery	19.8b[x]	30.2a	28.0b	22.1b	29.5ab	30.7ab
Ronstar	20.5b	42.7a	27.2b	19.7b	27.8b	28.4b
Regal 0-0	10.2c	22.1a	20.9b	9.3c	24.5b	22.5c
Control	38.3a	38.3a	38.3a	35.4a	35.4a	36.2a

[z] Growth indices = Height + width at widest point + width perpendicular ÷ 3

[y] Root coverage was an estimate of the percentage of the rootball surface covered with roots (0-100)

[x] means (within a column for each factor) with different letters are significantly different, according to Duncan's Multiple Range test (α=0.05)

Table 3. The influence of herbicide application during propagation 342 days after sticking on Loropetalum chinense 'Ruby'

	GI[z]			Root Coverage[y]		
Herbicide	Before Sticking	Lightly Rooted	Fully Rooted	Before Sticking	Lightly Rooted	Fully Rooted
Gallery	44.1a[x]	47.3a	47.1a	57.5b	63.3ab	65.5a
Ronstar	41.3a	44.2b	46.5a	56.1b	61.3b	64.0a
Regal 0-0	41.1a	45.2ab	51.9a	46.2c	52.8c	53.1b
Non-treated	43.7a	43.7b	43.7a	68.9a	68.9a	68.9a

[z] Growth Indices = height + width at widest point + width perpendicular ÷ 3

[y] Root coverage was an estimate of the percentage of the rootball surface covered with roots (0-100)

[x] means (within a column for each factor) with different letters are significantly different, according to Duncan's Multiple Range test ($\alpha = 0.05$)