

Tolerance of Herbaceous Perennials to Preemergence Herbicides

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Introduction

Herbaceous perennial production is increasing both in total plants produced and in number of new species grown. In the past several years this trend has steadily increased as more consumers demand long-lived color in the landscape. Weed control causes a major production problem because there are few labeled herbicides for herbaceous perennials particularly newly potted plants and newly introduced species.

A particularly troublesome weed in South Carolina is Hairy Bittercress (*Cardamine hirsuta*). Bittercress is a major weed problem in the production of greenhouse and nursery crops, particularly in the fall through spring seasons. One bittercress plant can forcefully expel a seed to a distance of 42 inches, and a single plant can produce up to 5000 offspring carpeting a circle 6 feet in diameter within 5 weeks. While well suited for winter growth in South Carolina, bittercress especially enjoys the winter protection afforded by Remy, a fabric commonly used for winter protection of many herbaceous perennials. Remy traps solar heat during the day and helps hold heat in during the night. When Remy is removed in the spring, bittercress has completely covered the pot.

To address this weed problem, we initiated a research project at Stacy's Greenhouse in York, SC. There were two objectives to the study. The first was to determine the phytotoxicity of granular preemergence herbicides to herbaceous perennials. The second was to determine effectiveness of granular preemergence herbicides on hairy bittercress. The primary goal was to find an herbicide(s), which could be applied before plants are covered with Remy, that effectively controls bittercress through the spring with no or minimum injury on several species of perennials.

Materials and Methods

This study was conducted on outside production beds at Stacy's Greenhouse, York SC. Twelve species of herbaceous perennials were evaluated for tolerance to four preemergence herbicides and bittercress control was also determined. Species in the study were: *Achillea millefolium* 'Red Beauty,' *Coreopsis verticillata* 'Moonbeam,' *Dianthus gratianopolitanus* 'Bath's Pink,' *Dianthus x allwoodii* 'Doris,' *Gaillardia grandiflora* 'Goblin,' *Hosta* sp., *Iberis sempervirens*, *Phlox subulata* 'Emerald Blue,' *Salvia x superba* 'Blue Queen,' *Sedum* 'Blue Spruce,' *Verbena canadensis* 'Rosea,' and *Verbena canadensis* 'Violet.' Perennial plugs or crowns were potted up in the fall and summer in 1 gal pots with a 85% pine bark and 15% sand media.

Four herbicides were applied at two rates each along with an untreated control. The herbicide treatments were Southern Weedgrass Control (pendimethalin) 2 & 4 lb ai/A, Snapshot TG (isoxaben + trifluralin) 2 & 4 lb ai/A, Stakeout (dithiopyr) 1 & 2 lb ai/A, and Rout (oxyfluorfen + oryzalin) 1.5 & 3 lb ai/A.

Plants were evaluated for herbicide injury (phytotoxicity) every week for the first six weeks on a scale from 0% to 100% where no visual injury = 0% and plant death is 100% injury. After the first six weeks, evaluation of the plants went to alternate weeks. During this time plants

were dormant and very little information could be obtained. In early spring (March 10, 121 Days After Treatment), evaluation returned to every week. Plants were examined for phytotoxicity, delay in green-up, and stunted growth.

Bittercress was seeded in two species, *Achillea* and *Gaillardia*, on November 9. Bittercress seeds were mixed with sand so that one tablespoon of sand contained about 20 viable bittercress seeds and one tablespoon of sand/seed mix was applied to each pot of *Achillea* and *Gaillardia*. Percent weed control were determined at each visit by ranking effectiveness of control on a scale of 0% to 100% compared to the untreated check. To determine the length of weed control exhibited by each herbicide, an additional two species were seeded with bittercress. On March 17 (129 DAT), bittercress seeds were added to *Iberis* and *Coreopsis*.

Results and Discussion

On the first evaluation (20 Days After Treatment- Nov. 29), Hosta treated with Rout began to show injury symptoms. This injury was expected, since the product's label urged precaution when used on Hosta. Hosta and similar plants will channel the granules toward the leaf base, resulting in basal burn of the foliage. This basal injury caused a wilting of the foliage. All of the Hosta went dormant by the December 15 evaluation (36 DAT). Hosta began to emerge uniformly in the spring (129 DAT-March 17). All new growth was healthy and free of herbicide injury.

Rout injury was also observed in *Phlox subulata* 'Emerald Blue' on the December 15 evaluation (36 DAT). These symptoms appeared as necrotic foliage in the center portion of the plant. This necrotic area grew progressively larger at each of the later evaluations. On January 3 (55 DAT), cold damage was observed on all of the Phlox. The cold damage and herbicide injury symptoms were similar, however, the plants treated with Rout had more injury. The spring growth of Phlox masked the herbicide damage and by March 24 (136 DAT) the injury was barely observable.

In early spring (129 DAT-March 17), *Salvia x superba* 'Blue Queen' began to show herbicide injury from Snapshot TG and Stakeout. This injury appeared as plant stunting, and floral bud delay. Rout injury was also evident on this species by March 24 (136 DAT). Injury was distinctly greater for all three herbicides at the higher rates. *Salvia* began flowering on April 21 (164 DAT) in the control and low rate of Rout, but plants treated with the high rate of Rout, both rates of Snapshot TG, and both rates of Stakeout were considerably shorter and showed few to no flowers. Southern Weedgrass Control was the only herbicide that did not injure *Salvia*.

Stakeout injured *Sedum* 'Blue Spruce' in the early spring (129 DAT-March 17, evaluation) by stunting and reddening the plant foliage. The damage was quite severe, and grew progressively worse at later evaluations. *Sedum* was not injured by the other herbicides.

Rout, Snapshot TG, and Stakeout controlled bittercress. However, bittercress was not effectively controlled with Southern Weedgrass Control herbicide at the rates used.

Bittercress control is presented in Table 1. The control illustrated from the evaluation on February 24 (108 DAT) reflects the bittercress seed planted into the pots on November 9, and the data on April 21 (164 DAT), represents the control from the March 17 (129 DAT) bittercress sowing. Southern Weedgrass Control gave only about 40-60% control. This is inadequate, since with only 50% control, many seeds will still be produced and germinate under Remy. Rout, Snapshot TG, and Stakeout provided excellent bittercress control.

Conclusion

Southern Weedgrass Control herbicide did not injure any of the twelve species, however, it was relatively ineffective in controlling bittercress. While Southern Weedgrass Control was not effective on bittercress it could have great potential in future work with the control of other weeds in herbaceous perennials. Rout, Stakeout, and Snapshot TG controlled bittercress, but injured one or more perennials. From this study, no single herbicide was identified that controlled bittercress without phytotoxicity on the desirable plant. Therefore, prescription herbicide selection may be needed to effectively control bittercress without injury to the crop. Different herbicides would be used for different perennials, for example, one might use Stakeout on Phlox and Hosta, but not on Sedum.

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We are especially grateful to Louis Stacy for not getting too mad when we told him we were deliberately seeding bittercress in his nursery.

Table 1. Bittercress control with preemergence herbicides. Numbers are percent control of bittercress by various herbicides.

Herbicide	Rate lb ai/A	Feb 24 (108 DAT)	Apr 21 (164 DAT)
So. Weed Grass	2.0	50 b	43 c
So. Weed Grass	4.0	52 a	69 b
Snapshot TG	2.0	92 a	99 a
Snapshot TG	4.0	100 a	100 a
Stakeout	1.0	99 a	95 a
Stakeout	2.0	100 a	100 a
Rout	1.5	90 a	82 a
Rout	3.0	93 a	84 a
Control	---	0 c	0 d
LSD (P= 0.05)		19	16