Weed Control and Phytotoxicity of Selected Herbicides for Container Production

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Significance to the Industry: Weed control is one of the biggest issues faced in the nursery industry and much money is spent to control weeds. With increasing EPA standards, increasing herbicide resistance, and phytotoxicity concerns, there is never enough control options.

Materials and Methods: Dimension (dithiopyr, Dow AgroSciences, Indianapolis, IN), is an excellent herbicide for control of crabgrass, and Dow wants to evaluate different formulations for phytotoxicity on nursery crops and weed control. The objective of this study was to compare Dimension as two formulations (2 EW and 40 WP), alone and in combination with Gallery (isoxaben, Dow AgroSciences) to other common nursery herbicides. Treatments consisted of the following: Dimension 2EW at 0.5 lb ai/ac, Dimension 2EW + Gallery at 0.5 + 1.0 lb ai/ac respectively, Dimension 40WP at 0.5 lb ai/ac, Dimension 40WP + Gallery at 0.5 + 1.0 lb ai/ac respectively, Surflan (oryzalin, Dow AgroSciences) at 2.0 lb ai/ac, Surflan + Gallery at 2.0 + 1.0 lb ai/ac respectively, Barricade (prodiamine, Syngenta Crop Protection, Inc., Greensboro, NC) at 0.75 lb ai/ac, Snapshot (isoxaben + trifluralin, Dow AgroSciences) at 0.75 + 3.0 lb ai/ac, respectively, Snapshot at 1.0 + 6 lb ai/ac, respectively, BroadStar (flumioxazin, Valent USA Corp., Walnut Creek, CA), and untreated control. Liquid formulations were applied with a CO_2 backpack sprayer calibrated to deliver 25 gal/ac using Teejet™ 8002 evs nozzles at 45 psi. Snapshot (both rates) and BroadStar were applied with a handheld shaker jar. Evaluations of phytotoxicity were done on #1 containers of Spireae (*Spireae japonica* "Little Prince"), Viburnum (*Viburnum plicatum var. tomentosum* 'Mariesii'), Duetzia (*Duetzia gracilis* 'Nikko'), Hydrangea (*Hydrangea macrophylla* "Forever Pink"), and Liriope (*Liriope spicata* 'Silver Dragon') by taking visual ratings on a scale of 1-10 (1 being no phytotoxicity and 10 death and ≤3 commercially acceptable), and taking heights and widths. Efficacy visual ratings based on a 0-10 scale (0 being no weed control and 10 perfect weed control) were taken using prostrate spurge (*Chamaesyce prostrata*), annual bluegrass (*Poa annua*), and common groundsel (*Senecio vulgaris*). Efficacy was also evaluated by taking counts of each weed at each evaluation (from 0-10; weeds were thinned to 10 as they emerged). Large crabgrass (*Digitaria sanguinalis*) and yellow woodsorrel (*oxalis stricta*) were also included in the efficacy study but emergence was very low. Data was taken for these two species only at the last evaluation. Efficacy and phytotoxicity evaluations were assessed at 15, 30, 60, and 90 DAT (days after treatment). Trials of efficacy and phytotoxicity were set up in a randomized complete block design. Treatments for phytotoxicity were compared to the untreated using Dunnett's t-test ($\alpha = 0.05$), and treatments for efficacy were compared using lsmeans ($\alpha = 0.05$). Efficacy and phytotoxicity were analyzed using SAS (SAS Institute, Cary, NC) Proc Mixed.

Results and Discussion:

Phytotoxicity. Spirea and Viburnum showed no phytotoxicity from any of the treatments (Table 1.) Hydrangea showed injury from both formulations of Dimension, with or without Gallery. Surflan + Gallery also injured Hydrangea. Dimension 2EW (with and without Gallery), Dimension 40WP + Gallery, Surflan (with and without Gallery), and Snapshot at the higher rate all injured Duetzia. Only Dimension 40WP and Broadstar injured Liriope. Using commercially acceptable levels, only Dimension 2EW (with and without Gallery) and Dimension 40WP + Gallery was phytotoxic on Hydrangea. No other treatments provided commercially unacceptable levels of injury on any of the other species over the period of the study.

Efficacy. Surflan+Gallery was the most efficacious treatment throughout the study (Table 1). None of the treatments controlled all four species that was seeded, which explains the low efficacy ratings (data not shown). There was also variance as to the effectiveness of each herbicide on the weed species across reps. The trial was hand-watered immediately after application, so it is possible that there was much variance in the amount of water delivered between containers. Most preemergence herbicides are not effective at 90 DAT in container mixes.

Table 1. Efficacy and Phytotoxicty of Some Nursery Herbicides on Selected Container Crops Averaged Over 15, 30, 60, and 90 DAT

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Treatment	Phytotoxicity					Efficacy
	Hydrangea macrophylla 'Forever Pink'[z]	Spirea japonica 'Little princess'	Duetzia gracilis 'Nikko'	Viburnum plicatum tomentosum 'Mariesii'	Liriope Spicata 'Silver Dragon'	
Dimension Ultra 2EW	3.25 *[y]	1.17	2.33 *	1.33	1.17	2.33 d
Dimension Ultra 40WP	3.5 *	1.75	1.83	1.33	2.25 *	3.25 cd
Dimension Ultra 2EW + Gallery	3.25 *	1.33	2.33 *	1.17	1.33	3.83 bc
Dimension Ultra 40WP + Gallery	2.92 *	1.67	2.41 *	1.5	1.5	4 bc
Surflan	1.5	1.67	2.5 *	1.25	1	3.17 cd
Surflan + Gallery	2.17 *	1.67	2.17 *	1.25	1.17	6.5 a
Barricade 65 WG	1.25	1.17	1.58	1.42	1.17	2.33 d
Snapshot 150	1.42	1.5	1.58	1.5	1.25	3.42 bcd
Snapshot 200	1.92	1	1.83 *	1.75	1.25	4.67 b
Broadstar	1.58	1.33	1.58	1.5	2.17 *	2.75 cd
Untreated	1.25	1.08	1	1.17	1.25	0 e

z= Full names of species: Spirea japonica "Little Princess", Viburnum plicatum tomentosum "Mariesii", Duetzia gracilis 'Nikko', Hydrangea Macrophylla "Forever Pink", Liriope Spicata 'Silver Dragon'

y= Treatments marked with an * are significantly different from the controls for that species, based on Dunnett's t-test (α = 0.05)

x= Treatments with averages followed by the same letter are not significantly different, based on lsmeans (α = 0.05)