

Comparison of Specticle G vs. Marengo G in Containerized Ornamentals

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Background. Specticle and Marengo are both 0.2224% granular formulations of indaziflam. Specticle G is labeled for turf, landscapes, and hardscapes. Marengo G is labeled for production ornamentals in containers, hoop-houses and shade-houses. The objectives of this trial were to compare phytotoxicity responses for Specticle G, Marengo G and a non-treated control with two known indaziflam sensitive species (Bayer communications) and three non-sensitive (Bayer communication) containerized ornamentals at three rates, 200 lbs/ac, 400 lbs/ac, and 800 lbs/ac.

Materials and Methods. A trial was initiated on 13 June, 2013 at The Ohio State University Main Campus in Columbus, OH. Five containerized ornamentals; *Spirea japonica* 'Magic carpet', *Berberis thunbergii* 'Bailsel' 'Golden carousel', *Cornus alba* 'variegata', *Tilia americana*, and *Amelanchier canadensis* were selected and treated with three rates each of Marengo G and Specticle G; 200 lbs/ac, 400 lbs/ac, and 800 lbs/ac. The granular formulations were applied using handheld shaker jars and over-the-top of the plant material. The herbicides were allowed to set on the foliage for one day and then were watered in with at least 0.5" water using overhead irrigation. The *Berberis*, *Cornus*, and *Spirea* were upshifted to #2 (2 gal. trade size) containers just prior to trial initiation, and the *Tilia* and *Amelanchier* were already established in #3 (3 gal. trade size) containers. The media for all species consisted of a 70% pine bark, 20% comtil (composted sewage sludge), and 10% pea gravel. Plants that were in the #2 containers received 2 tablespoons of Osmocote Pro 17-5-11 fertilizer as a topdress while those in the #3 containers received 3 tablespoons. The trial was set up in a completely randomized design within each species with each treatment having four replications and two subsamples/replication. Subsampling was not required in the Bayer protocol and for the *Cornus* only single plant replicates were evaluated due to insufficient numbers for this species. Evaluations consisted of visual ratings based on a 0-10 scale with 0 being no phytotoxicity, 10 death and ≤ 3 commercially acceptable at 1 WAT (weeks after treatment), 2 WAT, 3 WAT, 5 WAT, 6 WAT, 8 WAT and 10 WAT. Data was analyzed using SAS® Proc Mixed. Treatments were compared to the controls using Dunnett's t-test ($\alpha = 0.10$ and 0.05). Non-orthogonal contrasts between the phytotoxicity means of the two products at each of the three rates and summed overall rate responses were also conducted to determine differences between the two herbicide formulations, dependent on rate.

Results and discussion. *Spirea* 'Magic carpet' and *Berberis* 'Bailsel' were the two indaziflam sensitive plants that we used as identified by Bayer before the trial began and our data concurs with Bayer. These two species exhibited significantly greater

phytotoxicity symptoms versus the control than the three non-sensitive species, *Cornus*, *Tilia*, and *Amelanchier* combined (Table 1). For *Spirea*, the injury was very severe with some treatments, ex. Specticle 400 and 800 lb. (Fig. 1) and Marengo 800 lb. and occurred early after application. With the *Spirea* the injury decreased over-time, becoming commercially acceptable even with the 800 lb. rate of Specticle by 10 WAT; although, the treatment effect was still noticeable (Fig. 2). The *Berberis* injury, however, was more consistent and persistent over time compared to the control (Table 1). Even at 10WAT the *Berberis* with the Specticle 400 and 800 lb. rates had noticeable sparser or leggy growth, leaf spotting and a phenotypic change in coloration (Figs. 3 and 4). The *Cornus* did show some injury from the Specticle at 400 and 800 lb/ac that persisted until 8 WAT (Fig. 5) and 10WAT with the 800 lb/ac rate (Table 1). There was some anthracnose injury to the *Cornus*, which caused some high visual ratings and the high amount of variation between replicates and subsamples (Table 1). Most of the injury to the *Tilia* was not from the application of indaziflam but the invasion of Japanese beetles and spider mites. However, insects do have an innate ability to infest weaker plants, so it is possible that the indaziflam had a “synergistic effect.” The *Amelanchier* showed no phytotoxicity from any of the treatments or rates compared to the controls (Table 1).

Data from this trial indicates that there were differences between the Marengo and Specticle formulations (Table 2). Non-orthogonal contrasts were carried out averaged over all dates to determine rate differences and differences across all rates. There were no differences at the 200 lb/ac rates for any of the species, but as the rate increased, differences became very evident, especially with *Spirea* (Table 2). *Berberis*, the other sensitive species did show differences between the two formulations at the 800 lb/ac rate only. Across all rates with the *Berberis*, there was no difference between the two rates (Table 2). *Cornus* was another species that did show differences between the formulations at the 800 lb/ac rate, and there was also a difference when all rates were accounted for at $p=0.06$ (Table 2).

In summary, the normal rate (200 lb/ac) of Marengo or Specticle could be applied safely to all five species we evaluated with no differences between the two formulations being evident. However, if rates higher than 200 lb/ac are used (due to mis- or over-application) especially with applications of Specticle, injury is probable. The probability of injury will increase significantly if indaziflam sensitive species are present in the landscape.

Table 1. Visual ratings of Marengo G and Specticle G in comparison to the controls for five containerized ornamentals.

Spirea japonica 'Magic Carpet'

Treatment	Rate/ac	1 WAT ^z	2 WAT	3 WAT	5 WAT	6 WAT	8 WAT	10 WAT
Untreated	--	2 ^y	0.8	1.3	0.6	0.6	0.0	0.0
Marengo	200 lb	2.1	1.6	1.8	1.3	2.4 **	0.0	0.0
Marengo	400 lb	3.4 *	1.5	1.5	1.6	2.4 **	0.5	0.3
Marengo	800 lb	2.8	3.5 **	2.5 **	2.9 **	2.6 **	0.6	1.3 **
Specticle	200 lb	3.5 **	1.8	1.8	2.0	2.0 *	0.3	0.3
Specticle	400 lb	7.0 **	5.1 **	5.4 **	3.3 **	3.5 **	2.1 **	1.8 **
Specticle	800 lb	7.1 **	6.1 **	6.6 **	4.3 **	4.4 **	4.5 **	2.9 **

Cornus alba variegata

Treatment	Rate/ac	1 WAT	2 WAT	3 WAT	5 WAT	6 WAT	8 WAT	10 WAT
Untreated	--	1.8	1.0	1.8	3.3	4.8	2.0	1.3
Marengo	200 lb	3.0	2.0	2.0	2.0	1.7 **	0.5	0.0
Marengo	400 lb	3.5	3.0	3.5	3.0	3.5	2.5	1.3
Marengo	800 lb	5.0	3.3	2.5	2.5	2.3	1.0	0.3
Specticle	200 lb	3.8	3.3	2.3	3.0	2.3	1.0	0.8
Specticle	400 lb	4.5	3.8 *	3.3	3.0	3.8	2.0	1.3
Specticle	800 lb	6.3 **	4.3 **	4.0 *	3.3	5.3	4.5	4.3

Berberis thunbergii 'Golden Carousel'

Treatment	Rate/ac	1 WAT	2 WAT	3 WAT	5 WAT	6 WAT	8 WAT	10 WAT
Untreated	--	3.9	4.0	2.9	0.9	1.7	1.0	0.7
Marengo	200 lb	4.8	5.0	4.0	1.7	2.0	0.7	1.8
Marengo	400 lb	3.9	5.0	3.3	3.4 **	2.8	2.8 *	2.4 *
Marengo	800 lb	3.0	3.0	2.4	2.9 **	2.9	2.0	2.6 **
Specticle	200 lb	3.8	4.8	3.5	3.4 **	2.6	1.8	1.6
Specticle	400 lb	3.1	3.6	3.5	3.5 **	3.3	2.4	3.4 **
Specticle	800 lb	3.5	4.0	3.6	3.9 **	3.4	3.1 **	3.6 **

Tilia americana

Treatment	Rate/ac	1 WAT	2 WAT	3 WAT	5 WAT	6 WAT	8 WAT	10 WAT
Untreated	--	1.3	1.5	2.3	0.4	1.4	2.5	3.0
Marengo	200 lb	2.5	3.5	2.6	0.4	4.0	2.5	2.8
Marengo	400 lb	3.4 **	5.4 **	4.5 **	4.1 **	5.5 **	4.5	3.4
Marengo	800 lb	2.6	3.5	3.3	5.6 **	3.8	4.1	4.3
Specticle	200 lb	2.3	3.0	3.4	2.6	2.9	3.4	2.5
Specticle	400 lb	3.3 **	3.8	3.5	1.6	4.5 **	3.8	2.9
Specticle	800 lb	2.9 *	2.4	3.5	5.0 **	5.6 **	5.5 *	5.3 *

Amelanchier canadensis

Treatment	Rate/ac	1 WAT	2 WAT	3 WAT	5 WAT	6 WAT	8 WAT	10 WAT
Untreated	--	0.0	0.0	0.5	0.0	0.0	0.0	0.4
Marengo	200 lb	0.0	0.0	0.6	0.0	0.0	0.4	0.8
Marengo	400 lb	0.0	0.0	0.3	0.0	0.0	0.8	0.6

Marengo	800 lb	0.0	0.0	0.0	0.0	0.0	0.6	1.1
Specticle	200 lb	0.0	0.0	0.9	0.0	0.0	0.4	0.9
Specticle	400 lb	0.0	0.0	0.5	0.0	0.0	0.6	0.6
Specticle	800 lb	0.0	0.0	0.1	0.0	0.0	0.4	0.6

z = weeks after treatment

y = Visual ratings based on a 0-10 scale with 0 being no phytotoxicity and 10 death with ≤ 3 commercially acceptable

x = Treatment means followed by * and ** are significantly different from the control based on Dunnett's t-test ($\alpha = 0.10$ and 0.05 , respectively).

Table 2. Contrast differences for rates as well as across rates between Specticle G and Marengo G for five containerized ornamentals.

Spirea japonica 'Magic Carpet'

Contrast	Difference	p-value
Sp200 vs M200 ^z	0.4102	0.3317
Sp400 vs M400	2.4487	<.0001
Sp800 vs M800	2.8482	<.0001
Sp all vs M all	5.7071	<.0001

Berberis thunbergii 'Golden Carousel'

Contrast	Difference	p-value
Sp200 vs M200	0.04031	0.9288
Sp400 vs M400	-0.04957	0.9056
Sp800 vs M800	0.8809	0.0394
Sp all vs M all	0.8717	0.2446

Cornus alba variegata

Contrast	Difference	p-value
Sp200 vs M200	0.7276	0.4694
Sp400 vs M400	0.2984	0.7655
Sp800 vs M800	2.3227	0.0285
Sp all vs M all	3.3487	0.0637

Tilia americana

Contrast	Difference	p-value
Sp200 vs M200	0.1963	0.7047
Sp400 vs M400	-0.99	0.0604
Sp800 vs M800	0.4497	0.3869
Sp all vs M all	-0.344	0.7014

Amelanchier canadensis

Contrast	Difference	p-value
Sp200 vs M200	0.05518	0.7754
Sp400 vs M400	0.01464	0.9396
Sp800 vs M800	-0.1182	0.5416
Sp all vs M all	-0.04839	0.8851

z = Sp: Specticle, M: Marengo, 200: 200 lb/ac, 400: 400 lb/ac, 800: 800 lb/ac



Fig. 1. *Spirea japonica* 'Magic Carpet' 3WAT with Specticle G at 800 lb./ac showing severe dieback, stunting, spotting and leaf malformation.



Fig. 2. *Spirea japonica* 'Magic Carpet' 10WAT with Specticle G at 800 lb./ac (right) still showing some stunting versus the control (left).



Fig. 3. *Berberis thunbergii* 'Golden Carousel' at 10 WAT of 400 lb./ac application of Specticle G (right) showing sparser growth, leaf spotting and change in color versus the control (left).



Fig. 4. *Berberis thunbergii* 'Golden Carousel' at 10 WAT of 800 lb./ac application of Specticle G (right) showing leggy or stretched out growth, leaf spotting and change in color versus the control (left).



Fig. 5. *Cornus alba variegata* at 8 WAT in the foreground are Marengo treated pots and he control, moving into the background of the *Cornus alba* we the stunting still evident at 8 WAT from the higher rates of Specticle.