

Phytotoxicity and efficacy evaluations of Specticle G compared to FreeHand G applied to actively growing landscape beds

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Abstract. New outstanding preemergence herbicides such as Specticle G (indaziflam) (Bayer Crop Science, Research Triangle Park, NC 27709) (0.2224% granular formulation) were researched and developed in the “downturn” years (post 2008) of the nursery/landscape industry. As the economy recovers, in 2014, the availability of such superior products is essential to bear the weight of years of slashed weed control budgets, neglected landscape beds and the ensuing increased seed-banks. Indaziflam is well positioned in this era of improved weed control budgets and raised customer finances. However, there are still landscape ornamental species that need to be added to the indaziflam label. The sponsor Bayer Environmental Science requested a landscape bed trial to compare Specticle G at 200, 400, and 800 lb/ac to FreeHand (dimethenamid-p + pendimethalin, BASF Corporation, Research Triangle Park, NC 27709) applied at 200 lb/ac. The objectives of this study were to evaluate phytotoxicity on three ornamental species with over the top applications on active growth and to evaluate efficacy in the surrounding bed. Three species were selected for phytotoxicity evaluations: liriopse (*Liriope spicata* 'Rubrum'), purple coneflower (*Echinacea* 'Magnus'), and purple fountain grass (*Pennisetum setaceum*). Efficacy was statistically similar between 400 lb/ac Specticle and FreeHand G, at all evaluation dates of 2, 4, 8, 10 and 12 WAT, only dropping to slightly below commercially acceptable (7) at 10 and 12 WAT. The 800 lb/ac Specticle only provided statistically improved weed control versus the 400 lb/ac rate at 10 and 12 WAT. At 12 WAT phytotoxicity was commercially acceptable with Specticle 400 lb/ac with *Liriope* but FreeHand 200 lb/ac had caused injury above commercially acceptable (3.0). Phytotoxicity with *Echinacea* and *Pennisetum* at 400 lb/ac rate of Specticle was not significantly different from the 200 lb/ac rate of FreeHand at 12 WAT and well within commercially acceptable. Only the 800 lb/ac rate of Specticle caused severe injury and only on *Echinacea* 'Magnus' with *Liriope* and *Pennisetum* even the 800 lb/ac Specticle did not provide injury above commercially acceptable.

Materials and methods. Three species: liriopse (*Liriope spicata* 'Rubrum'), purple coneflower (*Echinacea* 'Magnus'), and purple fountain grass (*Pennisetum setaceum*) were selected for tolerance and transplanted as established plants in landscape beds to the trial plots on 13 June, 2014. No treatments were applied for one month after transplanting to allow any transplant shock to be overcome. Transplant shock was minimal as the plot was irrigated as required to supplement rainfall and established soil-grown plants had been used. Treatments were applied on 17 July, 2014 and included three rates of indaziflam (Specticle G); FreeHand at 200 lb/ac; and untreated control. No irrigation was applied until 24 hours after treatment applications. Plots were each 2 m wide x 5 m long and contained one plant per species or three plants per plot at equal

spacing. A completely randomized design with four replications per treatment for a total of 20 plots was utilized. All granular formulations were hand applied with a shaker after pre-weighing the amounts required for each plot area. Evaluations of phytotoxicity were done at 2, 4, 8, 10, and 12 WAT (weeks after treatment) and consisted of visual ratings on a scale of 0-10 with 0 being no phytotoxicity, 10 death, and ≤ 3 commercially acceptable. Number of flowers was also counted for liriopie and purple coneflower. Weed control was also visually rated at the same time as phytotoxicity and rated on a scale of 0-10 with 0 being no control, 10 perfect control, and ≥ 7 commercially acceptable. Treatment means of phytotoxicity were compared to untreated control using Dunnett's t-test ($\alpha = 0.05$ and 0.10) in SAS® Proc Mixed. Treatment means for efficacy were separated using LSmeans ($\alpha = 0.05$) also in SAS® Proc Mixed.

Results and discussion.

Efficacy. All rates of Specticle G as well as FreeHand G provided commercially acceptable control at 2 WAT (Fig. 1). However, Specticle at 200 lb/ac failed to provide acceptable control from 4 WAT until the end of the experiment. Specticle at 400 and 800 lb/ac and FreeHand G provided essentially the same level of control until 10 WAT at which time the Specticle at 800 lb/ac provided better control than Specticle at 400 lb/ac and the FreeHand (Fig. 1). Data from this trial indicates that rates of Specticle of 400 lb/ac or higher will provide the same level of weed control as the FreeHand for up to 12 WAT. The 800 lb/ac rate of Specticle will provide acceptable control for up to 12 WAT. There was considerable weed pressure in all plots. The most common weeds in the plots consisted of redroot pigweed (*Amaranthus retroflexus*), large crabgrass (*Digitaria sanguinalis*), hairy galinsoga, (*Galinsoga ciliata*), giant foxtail (*Setaria faberii*), Eastern black nightshade (*Solanum ptycanthum*), common purslane (*Portulaca oleracea*), barnyardgrass (*Echinochloa crus-galli*), common lambsquarters (*Chenopodium album*), and Venice mallow (*Hibiscus trionum*). Problem weeds for Specticle G include the large crabgrass and the redroot pigweed and control of both species improved as the rate increased. Due to the severity of weed pressure and frequency of these two problem species, 400 lb/ac was required.

Phytotoxicity. All species tested showed injury from at least one herbicide treatment (Table 1). Liriopie was injured by all rates of Specticle G but only above commercially acceptable at the 400 lb/ac rate at 4 WAT and 10 WAT. FreeHand was consistently more phytotoxic on liriopie through the study (Table 1, Fig. 2). By 12 WAT phytotoxicity was commercially acceptable with Specticle 400 lb/ac for *Liriopie* but FreeHand 200 lb/ac had caused injury above commercially acceptable (3.0) (Fig. 3). Phytotoxicity with *Echinacea* and *Pennisetum* at 400 lb/ac rate of Specticle was not significantly different from the 200 lb/ac rate of FreeHand at 12 WAT and well within commercially acceptable. Only the 800 lb/ac rate of Specticle caused severe injury and only on *Echinacea* 'Magnus' (Fig. 4), with *Liriopie* and *Pennisetum* even the 800 lb/ac Specticle

did not provide injury above commercially acceptable. Flowers were also counted on the liriopie for the first two evaluations. All treatments reduced flower number, but Specticle at 200 lb/ac and 400 lb/ac and FreeHand G significantly reduced flower number at 2 WAT in comparison to the control (Fig. 3). Considerable variation existed between plots, the coneflower standard error was the highest (data not shown). At 10 WAT and 12 WAT, *Echinacea* phytotoxicity ratings were very high (Table 1, Fig. 4) at 800 lb/ac Specticle. The fountain grass did show some injury early on from Specticle G, but there was virtually no injury after 8 WAT from any of the herbicides (Table 1).

Conclusions: Data from this trial indicates that Specticle G will provide good to excellent weed control depending on the rate. Efficacy was statistically similar between 400 lb/ac Specticle and FreeHand G, at all evaluation dates of 2, 4, 8, 10 and 12 WAT, only dropping (for both products) to slightly below commercially acceptable (7) at 10 and 12 WAT. The 800 lb/ac Specticle G only provided statistically improved weed control versus the 400 lb/ac rate at 10 and 12 WAT. The 200 lb/ac Specticle failed to provide acceptable control beyond 2 WAT. The 400 lb/ac Specticle G is needed to provide a level of control that is similar to the industry standard (FreeHand G) when specific species are present and weed pressures are high. FreeHand G is a combination product containing two mitosis inhibitor herbicides, dimethenamid-p as a shoot inhibitor plus pendimethalin as a root inhibition. Since Specticle G contains only one herbicide and has significantly lower use rates than any herbicide currently on the ornamental market (Fig. 5), Specticle G is considered an exceptional choice for landscape managers.

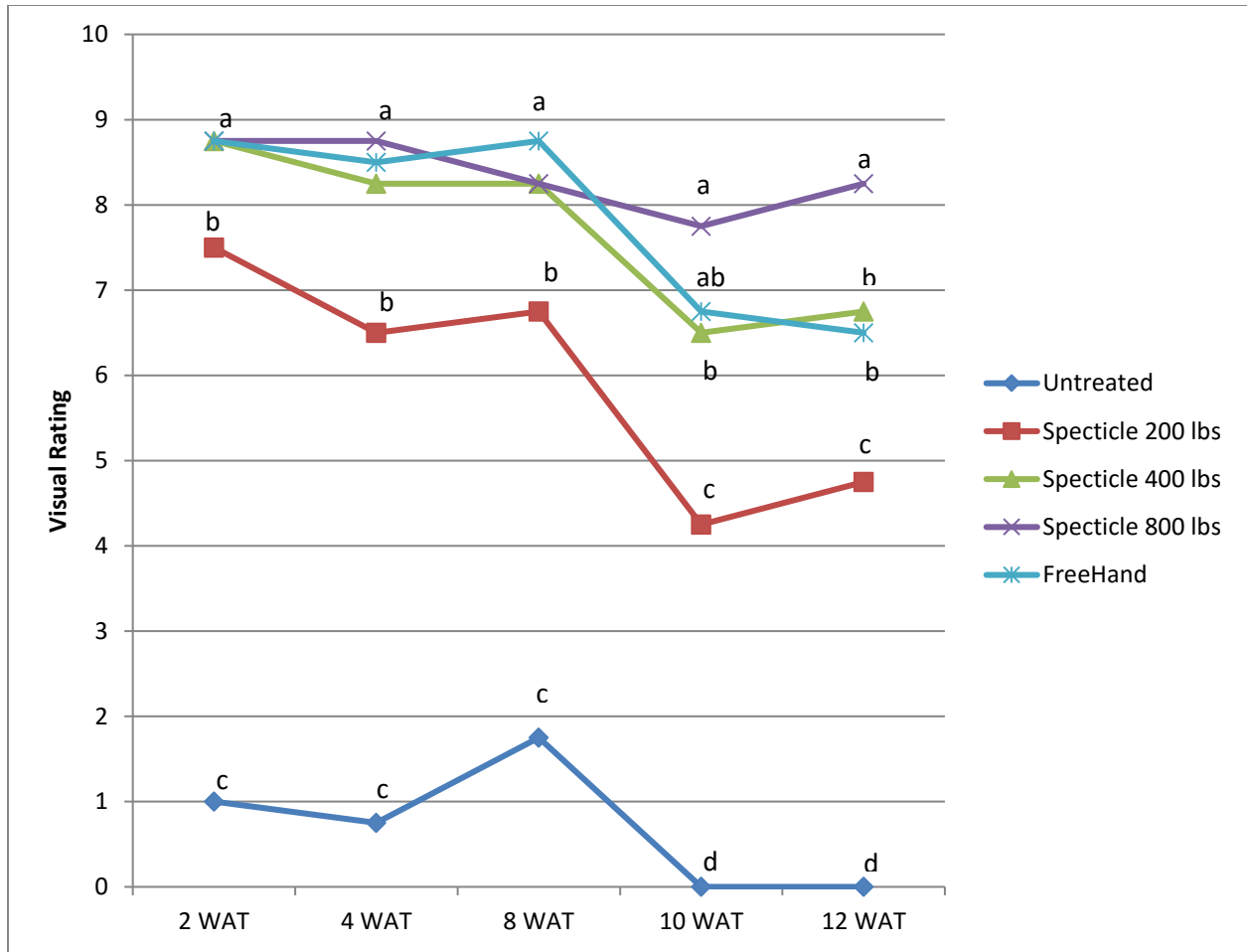


Fig. 1. Weed control from three rates of Specticle G (indaziflam) in comparison to FreeHand and untreated control evaluated over 12 weeks in landscape beds. Treatment means with the same letters from the same evaluation are not significantly different based on LSmeans ($\alpha = 0.05$).

Table 1. Phytotoxicity to three landscape ornamentals from three rates of Specticle G (indaziflam) in comparison to FreeHand and Untreated control in landscape beds.

Liriope spicata 'Rubrum'

Treatment	2 WAT ^z	4 WAT	8 WAT	10 WAT	12 WAT
Untreated	1.5 ^y _x	1.8	2.5	0.8	1.3
Specticle 200 lbs	3.5	4.5 *	4.0	4.3 **	2.5
Specticle 400 lbs	3.0	4.5 *	3.0	4.3 **	3.3
Specticle 800 lbs	1.8	2.5	2.8	3.8 **	2.5
FreeHand	4.5 **	3.5	3.0	4.5 **	4.0 **

Echinacea 'Magnus'

Treatment	2 WAT	4 WAT	8 WAT	10 WAT	12 WAT
Untreated	0.5	1.3	2.3	1.0	1.0
Specticle 200 lbs	3.7 *	4.0	3.7	3.3	2.7
Specticle 400 lbs	3.0	3.3	2.5	2.8	3.0
Specticle 800 lbs	2.8	4.5 *	4.3	7.0 **	7.5 **
FreeHand	2.3	1.8	2.3	1.8	2.8

Pennisetum setaceum

Treatment	2 WAT	4 WAT	8 WAT	10 WAT	12 WAT
Untreated	1.0	0.5	2.3	2.0	2.3
Specticle 200 lbs	3.0	2.0	2.5	1.3	1.3
Specticle 400 lbs	3.3	2.8 **	2.8	2.5	2.3
Specticle 800 lbs	1.0	0.8	3.0	2.0	1.5
FreeHand	1.0	0.8	2.0	1.3	1.5

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 in the same column followed by *, ** are significantly different from untreated control using Dunnett's t-test ($\alpha = 0.10, 0.05$, respectively)



Fig. 2. Injury to *Liriope spicata* 'Rubrum' from three rates of Specticle G in comparison to FreeHand G and untreated control.

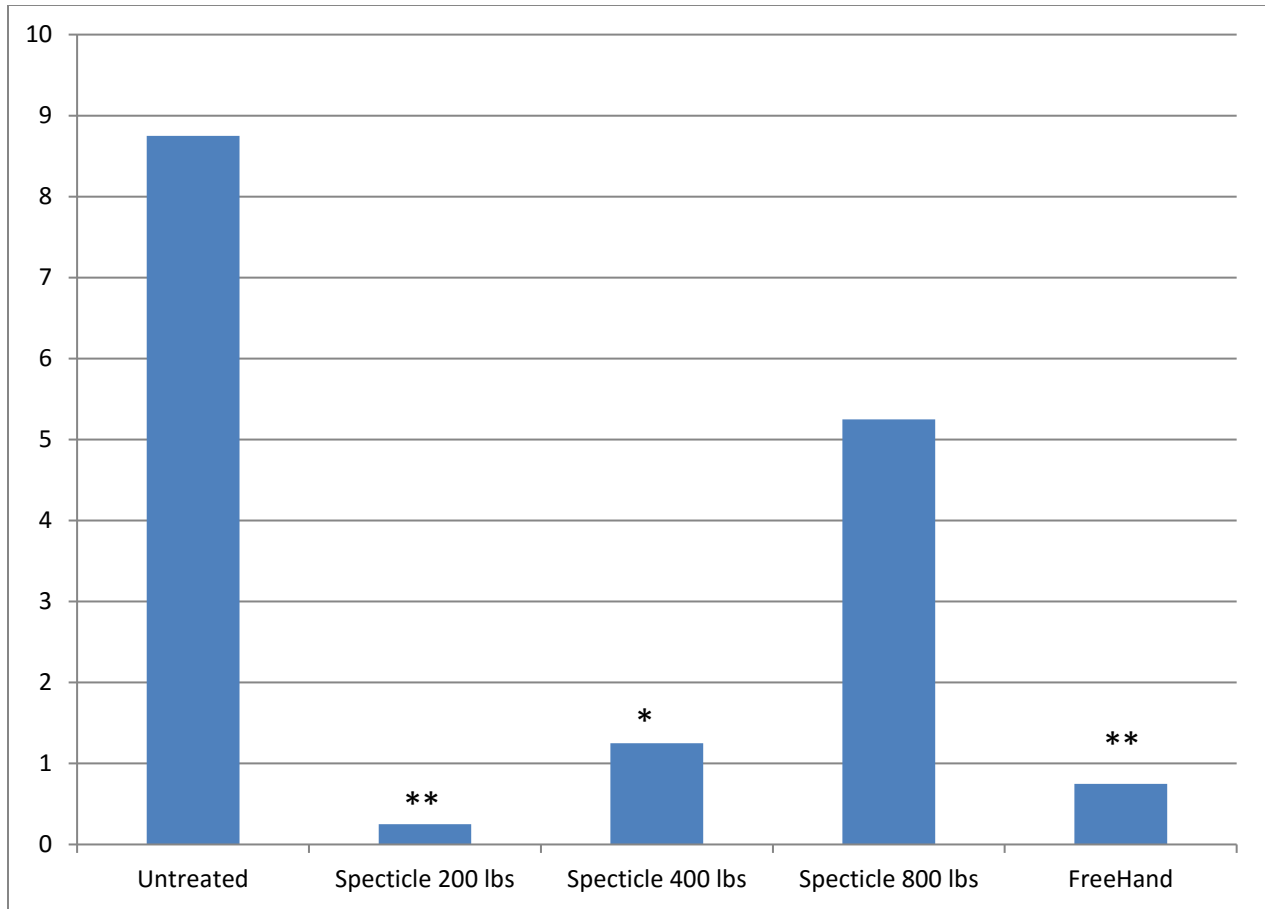


Fig. 3. Effect of treatment on flower number at 2 WAT for *Liriope spicata* in the landscape beds. Bars marked by *, ** are significantly different from the control based on Dunnett's t-test ($\alpha = 0.10$ and 0.05 , respectively).



Fig. 4. Injury to purple coneflower from 800 lbs/ac of Specticle at 10 WAT (left) in comparison to untreated control (right).

Standard Use Rates

			<u>lb a.i. / A</u>
▣ Snapshot TG	150 lb/A	Isox + Trifl	3.75
▣ OH-2	100 lb/A	Oxyfl + Pend	3.0
▣ Rout	100 lb/A	Oxyfl + Oryz	3.0
▣ Regal O-O	100 lb/A	Oxyfl + Oxad	3.0
▣ Ronstar 2G	200 lb/A	Oxadiazon	4.0
▣ BroadStar 0.25G [®]			
	150 lb/A	Flumioxazin	0.375
• Marengo G [®]	200 lb/A	Indaziflam	0.0448

Fig. 5. Standard use rate comparisons of currently marketed ornamental preemergence indicating the reduced lb a.i./ac of new products like flumioxazin and lower yet for the newer indaziflam (sold as Marengo for nursery and Specticle G for landscape. (Source: H. Mathers).