

A Promising Herbicide to Control Annual Bluegrass in Creeping Bentgrass Putting Greens



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Objectives:

1. *Comparison of methiozolin to other pre-emergence herbicides for annual bluegrass control on creeping bentgrass putting greens.*
2. *Weed spectrum of methiozolin on annual weeds, including crabgrass and goosegrass.*
3. *Evaluation of the safety of methiozolin on bentgrass putting greens following variable rates applied both spring and fall.*

Annual bluegrass (*Poa annua* L.) is the most troublesome weed worldwide in creeping bentgrass (*Agrostis stolonifera* L.) putting greens. Currently, there is no selective post-emergence herbicide available in the market that is labeled for creeping bentgrass putting greens. A few pre-emergence options labeled for greens either exhibit limited control of annual bluegrass, such as bensulide, or result in phytotoxicity to bentgrass, such as dithiopyr. Therefore, it is crucial to explore alternative chemicals that can result in high levels of annual bluegrass control and low phytotoxicity to putting greens.

Recently methiozolin, a plant cell wall biosynthesis inhibitor (CBI), was introduced for use in turf in the United States. The mechanism of action of this herbicide is unique among CBI inhibitors, as biosynthesis of both hemicelluloses and celluloses (two major cell wall constituents) is inhibited. Earlier research has found that when applied as a post-emergence herbicide in late fall and/or early winter, methiozolin effectively controlled annual bluegrass compared to the untreated control with minimal phytotoxicity on creeping bentgrass. Although methiozolin appears highly effective post-emergence, precluding annual bluegrass establishment

Figure 1. Representative effectiveness of methiozolin (1.0 kg ha^{-1}) for plots (Control on left and Treated on the right) at four weeks after treatment.



is more desirable, since the removal of existing plants leaves dead or open areas on the putting green.

Field plots (1.5×1.5 m) were established at single site in Oklahoma and Missouri. Experimental design was a randomized complete block design with four replications. Treatments included methiozolin at different rates (0.25, 0.50, 0.75 and 1.0 kg ai ha⁻¹) and application intervals (7, 14, or 28 days), in addition to bensulide, siduron, bensulide + oxadiazon, and dithiopyr at labeled rates (Table 1). Evaluations included weekly assessment of turf quality and phytotoxicity, and use of a hand-held sensor (GreenSeeker®) to estimate normalized difference vegetation index (NDVI).

In Missouri, the initial application was made on Sep 16, 2011 before annual bluegrass (*P. annua* f. *annua* L.) germination was observed, and was followed by spring applications starting on Mar 21, 2012. Preliminary results from the Missouri site found that methiozolin resulted in 95% or above annual bluegrass control at 8 weeks after initial treatment (WAIT), regardless of the rates and re-application intervals. In comparison, bensulide and dithiopyr application resulted in 60 to 70% annual bluegrass control. Treatment effect on general turf performance, indicated by NDVI, showed that methiozolin applied at 0.25 kg ai ha⁻¹ every 7 days

or monthly applications at 1.0 kg ai ha⁻¹ resulted in significantly lower NDVI readings than methiozolin at 0.5 or 0.75 kg ai ha⁻¹ every 14 days.

Results from Oklahoma site found no phytotoxicity on any methiozolin treated plots. However, significant discoloration was apparent on bensulide + oxadiazon treated plots in both spring and fall in 2012. Crabgrass encroachment was observed in the Oklahoma plot area in 2012. Methiozolin treatments resulted in a significant reduction in the density of crabgrass plants (35–97% control) compared to untreated plots. In comparison, bensulide and dithiopyr had no effect on crabgrass.

Summary

- Sequential applications of methiozolin starting in early fall provides effective annual bluegrass control at rates of 0.25 up to 1.0 kg ai ha⁻¹.
- Weekly application of methiozolin at 0.25 kg ai ha⁻¹ or monthly application at 1.0 kg ai ha⁻¹ reduced creeping bentgrass turf quality compared to other treatments.
- Methiozolin application shows promising control of crabgrass on creeping bentgrass greens.

Table 1. Treatment list for methiozolin and other pre-emergence herbicide labeled for creeping bentgrass putting greens.

Trt #	Treatment	Product	Rate (kg ai/ha)	Appl code*	Re-appl interval	Total appl.	Total rate (kg ai /ha/ season)
1	Methiozolin	PoaCure [®]	0.25	A	1 week	4 times	3
	Methiozolin	25 EC	0.25	B	1 week	8 times	
2	Methiozolin	PoaCure [®]	0.50	A	2 weeks	2 times	3
	Methiozolin	25 EC	0.50	B	2 weeks	4 times	
3	Methiozolin	PoaCure [®]	0.75	A	--	1 time	3
	Methiozolin	25 EC	0.75	B	2 weeks	3 times	
4	Methiozolin	PoaCure [®]	1.00	A	--	1 time	3
	Methiozolin	25 EC	1.00	B	4 weeks	2 times	
5	Methiozolin	PoaCure [®]	0.50	A	2 weeks	2 times	3
	Methiozolin	25 EC	0.50 fb 0.50 fb 1.00	B	2 weeks	3 times	
6	Bensulide	Bensumec [®] 4LF	14	B	--	--	14
7	Siduron	Tupersan [®] 50%	3.36	A	--	--	5.6
			2.24	B	--		
8	Bensulide + Oxadiazon	Andersons [®] Goosegrass/ crabgrass control	16.82	A	--	--	33.64
			16.82	B	--		
9	Dithiopyr	Dimension [®] 0.25G	0.56	B	--	--	0.56
10	Control	--	--	--	--	--	--

*Application timing code for Missouri site is: A: Early Spring (late March or early April); and B: Early fall (late August or early September). For the Oklahoma site: A: Early Spring (Late February or early March); and B: Early fall (late September or early October).

Figure 1. Methiozolin treatment effect on NDVI over the duration of the experiment. Means labeled by the same letter above the bar are not significantly different by Fisher’s protected LSD ($P = 0.05$).

