

Effect of MON 44951 on Creeping Bentgrass and *Poa trivialis*

Zac Reicher and Dan Weisenberger

Background/Objective:

Previous work has shown MON44951 to selectively control *Poa trivialis* in creeping bentgrass. However, since it is difficult to control a perennial grassy weed in a perennial turfgrass, further work is needed to refine the use of MON44951 to selectively control *Poa trivialis*.

Site Information

Location:	William H. Daniel Research and Diagnostic Center, W. Lafayette, IN.
Soil Type:	Starks-Fincastle silt loam
Soil pH:	7.2
Soil Organic Matter (%):	6.0
Turfgrass Species:	L-93 creeping bentgrass
Turf Condition:	Good
Turf Management: Mowing Height cm (in):	1.25 (0.5)
Fertilization:	121kg N/ha/yr (2.5 lbs/1000 ft ² /yr)
Irrigation:	To prevent moisture stress
Testing on Site Previous Year:	None
Target Pest:	'Lazer' <i>Poa trivialis</i>
Growth Stage:	

Application Information

Application Date:	16 May	30 May	5 June	13 June	27 June	17 July
Application Time:	8:00A	8:00A	7:30A	8:00A	8:00A	9:30A
Air Temperature C⁰(F⁰):	15.7(60)	18.2(65)	14.2(58)	28.6(83)	16.8(62)	29.5(85)
Relative Humidity(%):	73	50	77	66	71	41
Wind Speed m s⁻¹ (mph):	Calm	Calm	2.2 (5)	Calm	Calm	1.3 (3)
Soil Temperature(7.6 cm depth) C⁰(F⁰):	13.3(56)	12.2(54)	10.6(51)	21.1(70)	18.3(65)	23.9(75)
Soil Moisture:	Moist	Wet	Moist	Wet	Moist	Moist
Spray Volume L ha⁻¹ (gal 1000 ft⁻²):	814 (2)					
Spray Pressure:	35psi					
Spray Nozzle:	8001.5					
Spray Equipment:	CO ₂ backpack					
Irrigation After Application:	None					
Experimental Design:	Randomized complete block					
Replications:	3					
Plot Size m (ft):	1.5 X 1.5 (5 X 5)					

Results:

The data was not fully analyzed statistically as a factorial design because disappointingly little control of *Poa trivialis* was seen (Table 1). The disappointing results may be due to the relatively wet and cool summer or because a different cultivar of *Poa trivialis* was used for this study than what was used in earlier studies. The most effective rate of MON44951 was 0.02 lbs ai/A for controlling *Poa trivialis*. A minimum of two applications was needed to improve control and 4 applications provided best control. Repeated applications on two week intervals provided better control than those on three week intervals.

Unfortunately, the same application strategies that were most effective in *Poa trivialis* control were also most damaging to creeping bentgrass and reduced bentgrass quality into the summer (Tables 2 and 3). However, most of the damage occurred early in the summer primarily from the 2nd, 3rd and/or 4th -week applications. This was unusual because this degree of phytotoxicity had not occurred in previous years early in the summer. All phytotoxicity on creeping bentgrass ceased by the 7th week of the study and the reduction in bentgrass quality ceased by the 9th week.

To date, the best control strategy with MON44951 without compromising creeping bentgrass health appears to be a rate slightly lower than 0.02 lb ai/A applied at least four times on two week intervals. Beginning applications in June rather than May might increase the safety on creeping bentgrass.

It is interesting to note that the two treatments that were watered in seconds after application were active causing short-term phytotoxicity to the creeping bentgrass and *Poa trivialis* (Table 3). Multiple applications of Velocity caused severe phytotoxicity in creeping bentgrass and *Poa trivialis* and reduced *Poa trivialis* cover at 0.099 and 0.0132 lb ai/A. Much more refinement will be needed before we can determine if Velocity will be useful in controlling *Poa trivialis*.

Table 1. Percent cover^a by 'Lazer' *Poa trivialis*

Treatment	Rate of application	Application timing ^b	May 30	June 12	June 21	June 27	July 3	July 11	July 18	July 25	Aug 1	Aug 8	Aug 15
	lb a.i./A												
MON 44951	0.01	0	95.3	93.3	98.3	98.3	98.7	98.7	98.7	99.0	97.3	97.0	95.0
MON 0818	0.25c												
MON 44951	0.01	0	95.7	97.7	99.0	98.7	99.0	98.7	98.7	98.7	96.7	96.3	91.7
MON 0818	0.25c												
MON 44951	0.02	0	95.0	85.0	94.7	96.0	97.0	96.7	96.7	98.0	96.3	96.3	93.3
MON 0818	0.25c												
MON 44951	0.02	0	95.3	94.0	97.3	97.3	98.0	97.3	98.0	98.0	97.3	96.3	95.0
MON 0818	0.25c												
MON 44951	0.01	0, 2	95.3	75.0	88.3	91.7	95.7	95.7	96.0	97.0	93.3	94.0	88.3
MON 0818	0.25c												
MON 44951	0.01	0, 3	95.7	76.7	91.7	96.0	97.7	97.7	97.7	97.7	96.3	96.3	93.3
MON 0818	0.25c												
MON 44951	0.02	0, 2	95.7	60.0	75.0	86.7	91.7	91.7	93.7	93.3	91.7	88.3	81.7
MON 0818	0.25c												
MON 44951	0.02	0, 3	95.7	73.3	90.0	95.0	96.0	95.7	96.7	96.7	96.3	95.0	93.3
MON 0818	0.25c												
MON 44951	0.01	0, 2, 4	95.0	60.0	70.0	81.7	86.7	86.7	88.3	91.7	90.0	90.0	86.7
MON 0818	0.25c												
MON 44951	0.01	0, 3, 6	95.0	73.3	88.3	92.0	92.3	90.7	92.3	95.7	92.0	91.7	91.7
MON 0818	0.25c												
MON 44951	0.02	0, 2, 4	95.0	46.7	41.7	53.3	71.7	73.3	70.0	80.0	83.3	81.7	75.0
MON 0818	0.25c												
MON 44951	0.02	0, 3, 6	93.3	73.3	88.3	90.0	92.0	90.0	88.3	91.7	88.7	88.3	85.0
MON 0818	0.25c												
MON 44951	0.01	0, 2, 4, 6	95.3	68.3	70.0	86.7	86.7	83.3	85.0	88.3	83.3	85.0	80.0
MON 0818	0.25c												
MON 44951	0.01	0, 3, 6, 9	95.3	86.7	93.0	97.0	96.7	95.3	96.7	97.0	94.0	93.3	91.7
MON 0818	0.25c												
MON 44951	0.02	0, 2, 4, 6	95.3	56.7	45.0	65.0	63.3	53.3	55.0	50.0	55.0	58.3	60.0
MON 0818	0.25c												
MON 44951	0.02	0, 3, 6, 9	93.3	78.3	86.7	91.7	91.7	91.7	91.7	93.3	90.0	90.7	85.0
MON 0818	0.25c												
Check			96.7	98.0	99.0	99.0	99.0	98.3	98.3	99.0	97.7	97.0	95.0
Check			97.3	98.3	99.0	99.0	99.0	99.0	99.0	99.0	98.0	97.0	95.0
MON 44951	0.01	0 & water in	95.3	91.7	98.0	98.3	98.7	98.7	98.3	98.7	97.7	97.0	95.0
MON 0818	0.25c												
MON 44951	0.02	0 & water in	95.3	93.3	95.7	96.0	97.3	97.3	97.7	97.7	97.3	97.0	95.0
MON 0818	0.25c												
Velocity	0.033	0, 2	95.0	70.0	94.0	96.7	97.3	97.7	97.7	98.0	95.7	95.0	90.0
Velocity	0.066	0, 2	94.0	50.0	85.0	93.3	95.7	95.7	95.7	98.0	95.0	95.0	90.0
Velocity	0.099	0, 2	93.3	46.7	71.7	86.7	86.7	90.0	89.0	94.3	90.0	85.0	73.3
Velocity	0.132	0, 2	91.7	43.3	56.7	81.7	85.0	88.3	88.3	93.3	86.7	83.3	73.3
LSD (0.05)			2.4	17.5	10.0	10.8	9.7	6.9	7.5	5.8	8.1	7.0	8.2

^a Percent of the plot area covered by *Poa trivialis*.

^b Application timing is weeks after initial application (which was on 16 May).

^c Rate of application was percent volume per volume.

Table 2. Phytotoxicity^a to 'L93' creeping bentgrass.

Treatment	Rate of application	Application timing ^b	May 23	May 30	June 5	June 12	June 21	June 27	July 3	July 11	July 18	July 25	Aug 1	Aug 8	Aug 15
	lb a.i./A														
MON 44951	0.01	0	7.0	6.0	8.7	8.7	8.7	8.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.01	0	7.0	6.0	7.7	8.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0	6.3	4.3	5.0	8.3	8.7	9.0	8.7	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0	6.3	4.0	6.0	7.7	8.3	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.01	0, 2	6.3	4.7	3.7	7.7	8.7	8.7	7.7	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.01	0, 3	7.0	5.7	7.3	6.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0, 2	6.7	4.3	4.0	7.0	8.3	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0, 3	6.3	4.7	5.7	6.0	8.7	8.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.01	0, 2, 4	7.0	5.0	4.7	7.3	6.3	9.0	8.7	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.01	0, 3, 6	7.7	7.3	6.7	7.0	9.0	9.0	7.3	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0, 2, 4	6.7	4.3	3.7	7.0	5.3	8.7	8.3	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0, 3, 6	7.0	4.3	6.0	5.3	8.3	8.3	6.3	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.01	0, 2, 4, 6	6.7	5.0	4.3	8.0	6.7	8.3	7.3	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.01	0, 3, 6, 9	6.7	6.0	6.3	6.3	9.0	8.3	7.0	9.0	9.0	8.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0, 2, 4, 6	6.7	4.3	3.0	7.0	6.0	9.0	8.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0, 3, 6, 9	6.3	4.3	5.7	5.7	8.7	8.7	6.3	9.0	9.0	8.0	9.0	9.0	9.0
MON 0818	0.25c														
Check			9.0	9.0	8.7	8.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Check			9.0	9.0	9.0	8.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 44951	0.01	0 & water in	7.3	5.7	7.0	8.7	8.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
MON 44951	0.02	0 & water in	7.0	5.7	7.3	8.0	9.0	8.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25c														
Velocity	0.033	0, 2	6.0	8.0	6.3	9.0	8.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Velocity	0.066	0, 2	6.0	7.7	6.0	8.3	9.0	9.0	8.7	9.0	9.0	9.0	9.0	9.0	9.0
Velocity	0.099	0, 2	6.0	7.3	5.0	8.7	8.7	8.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Velocity	0.132	0, 2	6.3	6.0	4.7	8.0	9.0	9.0	8.7	9.0	9.0	9.0	9.0	9.0	9.0
LSD (0.05)			0.9	1.2	1.8	1.1	0.7	NS	0.8	NS	1.0	0.0	NS	NS	NS

^a Phytotoxicity was rated on a scale of 1 to 9, where 1 = completely brown turf, 7 = acceptable damage, and 9 = no phytotoxicity.

^b Application timing is weeks after initial application (which was on 16 May).

^c Rate of application was percent volume per volume.

Table 3. Quality^a of 'L93' creeping bentgrass.

Treatment	Rate of application	Application timing ^b	May 30	June 5	June 12	June 21	June 27	July 3	July 18	July 24	Aug 1	Aug 8	Aug 15
	Lb a.i./A												
MON 44951	0.01	0	4.7	6.0	6.3	7.3	5.3	5.7	5.0	6.7	7.0	7.0	7.0
MON 0818	0.25c												
MON 44951	0.01	0	5.0	5.7	6.7	7.3	5.3	6.0	5.3	6.7	6.7	6.7	6.7
MON 0818	0.25c												
MON 44951	0.02	0	4.0	3.7	5.3	6.3	5.3	5.7	5.0	6.3	7.0	7.0	7.0
MON 0818	0.25c												
MON 44951	0.02	0	4.0	4.0	5.3	6.0	5.0	5.0	5.3	5.3	6.3	7.0	7.0
MON 0818	0.25c												
MON 44951	0.01	0, 2	4.0	3.3	4.7	6.0	5.0	5.3	5.3	6.3	7.0	7.0	7.0
MON 0818	0.25c												
MON 44951	0.01	0, 3	4.7	4.7	4.7	7.0	6.0	6.0	5.3	6.3	6.3	7.0	7.0
MON 0818	0.25c												
MON 44951	0.02	0, 2	4.0	2.3	4.3	5.7	4.0	4.7	4.7	5.3	6.0	6.7	6.3
MON 0818	0.25c												
MON 44951	0.02	0, 3	4.0	3.3	3.7	5.7	4.7	4.7	4.3	5.0	6.0	6.0	6.3
MON 0818	0.25c												
MON 44951	0.01	0, 2, 4	4.3	3.0	4.7	5.0	4.3	5.0	4.3	5.7	6.3	7.0	7.0
MON 0818	0.25c												
MON 44951	0.01	0, 3, 6	5.3	5.0	4.7	6.7	5.3	4.7	5.3	6.3	6.7	6.7	7.0
MON 0818	0.25c												
MON 44951	0.02	0, 2, 4	4.0	2.7	4.3	5.3	4.0	4.3	4.3	4.7	5.7	6.7	6.0
MON 0818	0.25c												
MON 44951	0.02	0, 3, 6	4.0	3.7	3.7	5.0	4.3	3.7	4.3	5.0	6.0	6.0	6.7
MON 0818	0.25c												
MON 44951	0.01	0, 2, 4, 6	4.7	4.0	5.0	5.3	4.7	4.7	5.0	5.7	6.7	7.0	6.7
MON 0818	0.25c												
MON 44951	0.01	0, 3, 6, 9	4.0	4.3	4.0	6.3	5.3	5.3	5.0	5.7	6.3	7.0	7.0
MON 0818	0.25c												
MON 44951	0.02	0, 2, 4, 6	4.0	3.0	4.0	4.0	4.0	4.0	3.7	4.0	5.7	6.0	6.0
MON 0818	0.25c												
MON 44951	0.02	0, 3, 6, 9	4.0	4.3	4.0	5.3	4.7	4.3	4.3	4.7	5.3	6.3	6.3
MON 0818	0.25c												
Check			7.7	6.3	5.3	7.3	6.0	6.3	5.7	6.7	6.3	7.0	7.0
Check			7.7	6.7	6.3	7.7	6.0	6.0	6.0	6.3	7.3	7.0	7.0
MON 44951	0.01	0 & water in	6.0	5.7	5.7	6.7	5.7	5.7	5.7	6.0	6.7	7.0	7.0
MON 0818	0.25c												
MON 44951	0.02	0 & water in	4.3	4.3	5.3	6.7	5.7	6.3	5.3	6.0	6.3	6.7	7.0
MON 0818	0.25c												
Velocity	0.033	0, 2	7.3	4.0	5.7	7.0	6.0	6.0	6.0	6.7	6.7	7.0	7.0
Velocity	0.066	0, 2	6.7	3.7	4.7	7.3	6.0	6.0	5.3	6.7	6.7	7.0	7.0
Velocity	0.099	0, 2	5.7	3.7	5.7	7.7	5.7	5.7	5.7	6.7	6.3	7.0	6.7
Velocity	0.132	0, 2	5.7	3.7	5.0	7.0	5.7	5.7	5.3	5.7	6.0	6.3	7.0
LSD (0.05)			1.0	1.0	1.0	1.1	0.9	1.2	NS	1.1	0.8	NS	0.5

^a Quality was rated on a scale of 1 to 9 where 9 = an ideal fairway.

^b Application timing is weeks after initial application (which was on 16 May).

^c Rate of application was percent volume per volume.

Table 4. Phytotoxicity^a to 'Lazer' *Poa trivialis*.

Treatment	Rate of application	Application timing ^b	May 23	May 30	June 521	June 27	June 3	July 11	July 18	July 24	July 1	Aug
	Lb a.i./A											
MON 44951	0.01	0	6.3	5.7	6.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.01	0	7.3	6.0	7.0	8.7	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0	6.0	5.7	5.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0	6.3	5.7	5.7	9.0	9.0	9.0	9.0	9.0	8.7	9.0
MON 0818	0.25 ^c											
MON 44951	0.01	0, 2	6.3	6.7	4.3	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.01	0, 3	6.7	6.3	5.3	8.7	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0, 2	6.3	4.7	3.3	8.7	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0, 3	6.3	5.7	5.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.01	0, 2, 4	6.3	6.0	4.0	7.0	8.7	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.01	0, 3, 6	6.0	5.7	4.3	9.0	9.0	7.7	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0, 2, 4	6.7	5.0	3.0	7.0	8.7	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0, 3, 6	6.3	6.3	5.3	9.0	9.0	7.3	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.01	0, 2, 4, 6	6.7	6.7	3.7	7.0	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.01	0, 3, 6, 9	6.7	6.0	6.7	9.0	9.0	8.7	9.0	9.0	8.7	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0, 2, 4, 6	6.7	6.0	4.0	7.0	7.7	7.3	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0, 3, 6, 9	6.3	6.3	5.3	9.0	9.0	7.3	9.0	9.0	8.0	9.0
MON 0818	0.25 ^c											
Check			8.3	8.3	8.7	8.7	9.0	8.3	9.0	9.0	9.0	9.0
Check			9.0	9.0	8.3	9.0	9.0	8.7	9.0	9.0	9.0	9.0
MON 44951	0.01	0 & water in	8.0	7.0	6.0	9.0	9.0	9.0	9.0	9.0	8.7	9.0
MON 0818	0.25 ^c											
MON 44951	0.02	0 & water in	7.0	6.3	5.7	8.3	9.0	9.0	9.0	9.0	9.0	9.0
MON 0818	0.25 ^c											
Velocity	0.033	0, 2	6.3	5.7	4.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Velocity	0.066	0, 2	6.0	4.3	2.7	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Velocity	0.099	0, 2	6.0	4.0	2.3	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Velocity	0.132	0, 2	6.0	4.0	2.3	9.0	9.0	9.0	9.0	9.0	9.0	9.0
LSD (0.05)			1.0	1.2	1.5	0.5	0.3	0.5	NS	NS	0.5	NS

^a Phytotoxicity was rated on a scale of 1 to 9, where 1 = completely brown turf, 7 = acceptable damage, and 9 = no phytotoxicity.

^b Application timing is weeks after initial application (which was on 16 May).

^c Rate of application was percent volume per volume.