

## **Development of Tenacity, Applied in the Fall, for a fairway renovation program to eliminate *Poa annua* (post-emergence) in Kentucky bluegrass**

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A study was conducted at the Palouse Ridge Golf Club at WSU in Pullman, WA to determine the efficacy of Tenacity applied alone or combined with other grass weed herbicides for post-emergence control of *Poa annua* in a Kentucky bluegrass/*P. annua* fairway. Each treatment was applied at a spray rate of 25 GPA to the same plots on 22 Sept., 7 Oct., and 19 Oct. 2009 with a bicycle-wheeled CO<sub>2</sub> pressurized sprayer using 11002 flat fan spray nozzles at 40 psi. Individual plot size was 6' x 10'. The experimental design was a randomized complete-block with 3 replications. The percentage of *P. annua* within each plot was determined at the beginning (22 Sept. 2009) and at the end of the study (14 Apr. 2010). One week following the first application of herbicides, phytotoxicity on *P. annua* and Kentucky bluegrass was rated every week or two up to 2 Dec. 2009. Phytotoxicity was rated from 0 to 10; with 0 = no phytotoxicity and 10 = dead turf. Phytotoxicity levels > 2 are considered unacceptable.

Tenacity alone or with Velocity or Prograss did not cause an unacceptable level of phytotoxicity to *P. annua* until 3 weeks after initial treatment (WAIT), which was 1 week following the second application (Table 1). Surprisingly, there was more phytotoxicity to *P. annua* with Tenacity alone than Tenacity with Velocity or Tenacity with Prograss. These levels of phytotoxicity remained high through the last rating date 2 Dec. 2009. Fig. 1 shows the phytotoxicity to the turf on 27 Oct. 2009, 1 week following the last application.

Tenacity with Velocity resulted in unacceptable levels of phytotoxicity to Kentucky bluegrass 4 WAIT, which was 1 week following the second application (Table 2). Velocity alone also caused unacceptable levels of phytotoxicity to the Kentucky bluegrass but not until 6 WAIT.

The Tenacity with Prograss treatment resulted in the largest reduction of *P. annua* at 83% when rated on 14 Apr. 2010 (Table 3). Tenacity alone resulted in a reduction of 63%, followed by the Tenacity with Velocity and the Velocity alone treatments. Prograss alone resulted in the lowest reduction of all treatments at 15%. Fig. 2, 3, and 4 shows dead *P. annua* in the Prograss with Velocity treatment.

Overall, all treatments except Prograss 0.38 lb ai/A resulted in high levels of *P. annua* phytotoxicity by 4 WAIT. The 3 applications of Tenacity 0.156 lb ai/A with Velocity 10g ai/A or Velocity alone at the 10 g ai/A rate resulted in Kentucky bluegrass phytotoxicity above acceptable levels by 4 to 6 WAIT. The most effective treatment at reducing the percentage of *P. annua* in the fairway stand was the 3 applications of Tenacity 0.156 lb ai/A with Prograss 0.38 lb ai/A.

Table 1. The effect of late Fall applications of Tenacity alone or combined with other grass weed herbicides on *Poa annua* phytotoxicity. Palouse Ridge Golf Club at WSU 9 fairway.

Treatment	Chemical name	Rate (lbs or g ai/A)	App date	NIS (% V/V)	Poa annua phytotoxicity (rated 0 - 10)							
					10/1/09	10/7/09	10/15/09	10/27/09	11/2/09	11/9/09	11/18/09	12/2/09
Tenacity 4FL + NIS	Mesotrione	0.156 lb	1	0.25%	0	0.8 ab*	3.3 a	6.0 a	7.0 a	7.0 a	7.0 a	7.0 a
Tenacity 4FL + NIS	Mesotrione	0.156 lb	2	0.25%								
Tenacity 4FL + NIS	Mesotrione	0.156 lb	3	0.25%								
Tenacity 4FL + NIS + Velocity	Mesotrione Bispyribac-sodium	0.156 lb 10 g	1	0.25%	0	1.0 a	3.2 a	4.0 b	4.7 bc	5.3 b	5.3 b	5.7 b
Tenacity 4FL + NIS + Velocity	Mesotrione Bispyribac-sodium	0.156 lb 10 g	2	0.25%								
Tenacity 4FL + NIS + Velocity	Mesotrione Bispyribac-sodium	0.156 lb 10 g	3	0.25%								
Velocity + NIS	Bispyribac-sodium	10 g	1	0.25%	0	0.5 abc	0.7 b	3.7 b	4.0 c	4.3 b	4.3 b	5.7 b
Velocity + NIS	Bispyribac-sodium	10 g	2	0.25%								
Velocity + NIS	Bispyribac-sodium	10 g	3	0.25%								
Tenacity 4FL + NIS + Prograss	Mesotrione Ethofumesate	0.156 lb 0.38 lb	1	0.25%	0	0.7 abc	3.0 a	4.3 b	5.3 b	5.3 b	5.0 b	5.7 b
Tenacity 4FL + NIS + Prograss	Mesotrione Ethofumesate	0.156 lb 0.38 lb	2	0.25%								
Tenacity 4FL + NIS + Prograss	Mesotrione Ethofumesate	0.156 lb 0.38 lb	3	0.25%								
Prograss	Ethofumesate	0.38	1		0	0.0 c	0.0 b	0.0 c	0.0 d	0.0 c	0.0 c	1.7 c
Prograss	Ethofumesate	0.38	2									
Prograss	Ethofumesate	0.38	3									
Check					0	0.0 c	0.0 b	0.0 c	0.0 d	0.0 c	0.0 c	0.0 d

\*Means within columns followed by the same letter are not significantly different . LSD P = 0.05.

Table 2. The effect of late Fall applications of Tenacity alone or combined with other grass weed herbicides on Kentucky bluegrass phytotoxicity. Palouse Ridge Golf Club at WSU 9 fairway.

Treatment	Chemical name	Rate (lbs or g ai/A)	App date	NIS (% V/V)	Kentucky bluegrass phytotoxicity (rated 0 - 10)							
					10/1/09	10/7/09	10/15/09	10/27/09	11/2/09	11/9/09	11/18/09	12/2/09
Tenacity 4FL + NIS	Mesotrione	0.156 lb	1	0.25%	0	0.0 b*	0.0 b	0.0 b	0.0 b	0.0 b	0.0 c	0.3 c
Tenacity 4FL + NIS	Mesotrione	0.156 lb	2	0.25%								
Tenacity 4FL + NIS	Mesotrione	0.156 lb	3	0.25%								
Tenacity 4FL + NIS + Velocity	Mesotrione Bispyribac-sodium	0.156 lb 10 g	1	0.25%	0	1.0 a	2.2 a	3.0 a	4.3 a	5.0 a	5.3 a	5.7 a
Tenacity 4FL + NIS + Velocity	Mesotrione Bispyribac-sodium	0.156 lb 10 g	2	0.25%								
Tenacity 4FL + NIS + Velocity	Mesotrione Bispyribac-sodium	0.156 lb 10 g	3	0.25%								
Velocity + NIS	Bispyribac-sodium	10 g	1	0.25%	0	0.3 b	0.0 b	3.0 a	4.0 a	4.3 a	4.0 ab	5.3 a
Velocity + NIS	Bispyribac-sodium	10 g	2	0.25%								
Velocity + NIS	Bispyribac-sodium	10 g	3	0.25%								
Tenacity 4FL + NIS + Prograss	Mesotrione Ethofumesate	0.156 lb 0.38 lb	1	0.25%	0	0.0 b	0.0 b	0.0 b	0.0 b	0.8 b	2.3 b	1.3 b
Tenacity 4FL + NIS + Prograss	Mesotrione Ethofumesate	0.156 lb 0.38 lb	2	0.25%								
Tenacity 4FL + NIS + Prograss	Mesotrione Ethofumesate	0.156 lb 0.38 lb	3	0.25%								
Prograss	Ethofumesate	0.38	1		0	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 c	0.3 c
Prograss	Ethofumesate	0.38	2									
Prograss	Ethofumesate	0.38	3									
Check					0	0.0 b	0.0 b	0.0 b	0.0 b	0.0 b	0.0 c	0.0 c

\*Means within columns followed by the same letter are not significantly different . LSD P = 0.05.

Table 3. The percentage of *Poa annua* present at the beginning and the end of the study. Palouse Ridge Golf Club at WSU 9 fairway.

Treatment		Rate (lbs or g ai/A)	NIS (% V/V)	App. date	Original 9/22/09 <i>P. annua</i> present (% area of plot)	Final 4/14/10 <i>P. annua</i> present (% area of plot)	<i>P. annua</i> reduction (%)
Tenacity 4FL + NIS	Mesotrione	0.156 lb	0.25%	1	45.0	16.7	62.9
Tenacity 4FL + NIS	Mesotrione	0.156 lb	0.25%	2			
Tenacity 4FL + NIS	Mesotrione	0.156 lb	0.25%	3			
Tenacity 4FL + NIS + Velocity	Mesotrione	0.156 lb	0.25%	1	40.0	25.0	37.5
	Bispyribac-sodium	10 g					
Tenacity 4FL + NIS + Velocity	Mesotrione	0.156 lb	0.25%	2			
	Bispyribac-sodium	10 g					
Tenacity 4FL + NIS + Velocity	Mesotrione	0.156 lb	0.25%	3			
	Bispyribac-sodium	10 g					
Velocity + NIS	Bispyribac-sodium	10 g	0.25%	1	35.0	25.0	28.6
Velocity + NIS	Bispyribac-sodium	10 g	0.25%	2			
Velocity + NIS	Bispyribac-sodium	10 g	0.25%	3			
Tenacity 4FL + NIS + Prograss	Mesotrione	0.156 lb	0.25%	1	48.3	8.3	82.8
	Ethofumesate	0.38 lb					
Tenacity 4FL + NIS + Prograss	Mesotrione	0.156 lb	0.25%	2			
	Ethofumesate	0.38 lb					
Tenacity 4FL + NIS + Prograss	Mesotrione	0.156 lb	0.25%	3			
	Ethofumesate	0.38 lb					
Prograss	Ethofumesate	0.38		1	43.3	36.7	15.2
Prograss	Ethofumesate	0.38		2			
Prograss	Ethofumesate	0.38		3			
Check					46.7	45.0	3.6

Fig. 1. Phytotoxicity 1 week after the last application 27 Oct. 2009. Palouse Ridge Golf Club at WSU 9 fairway.

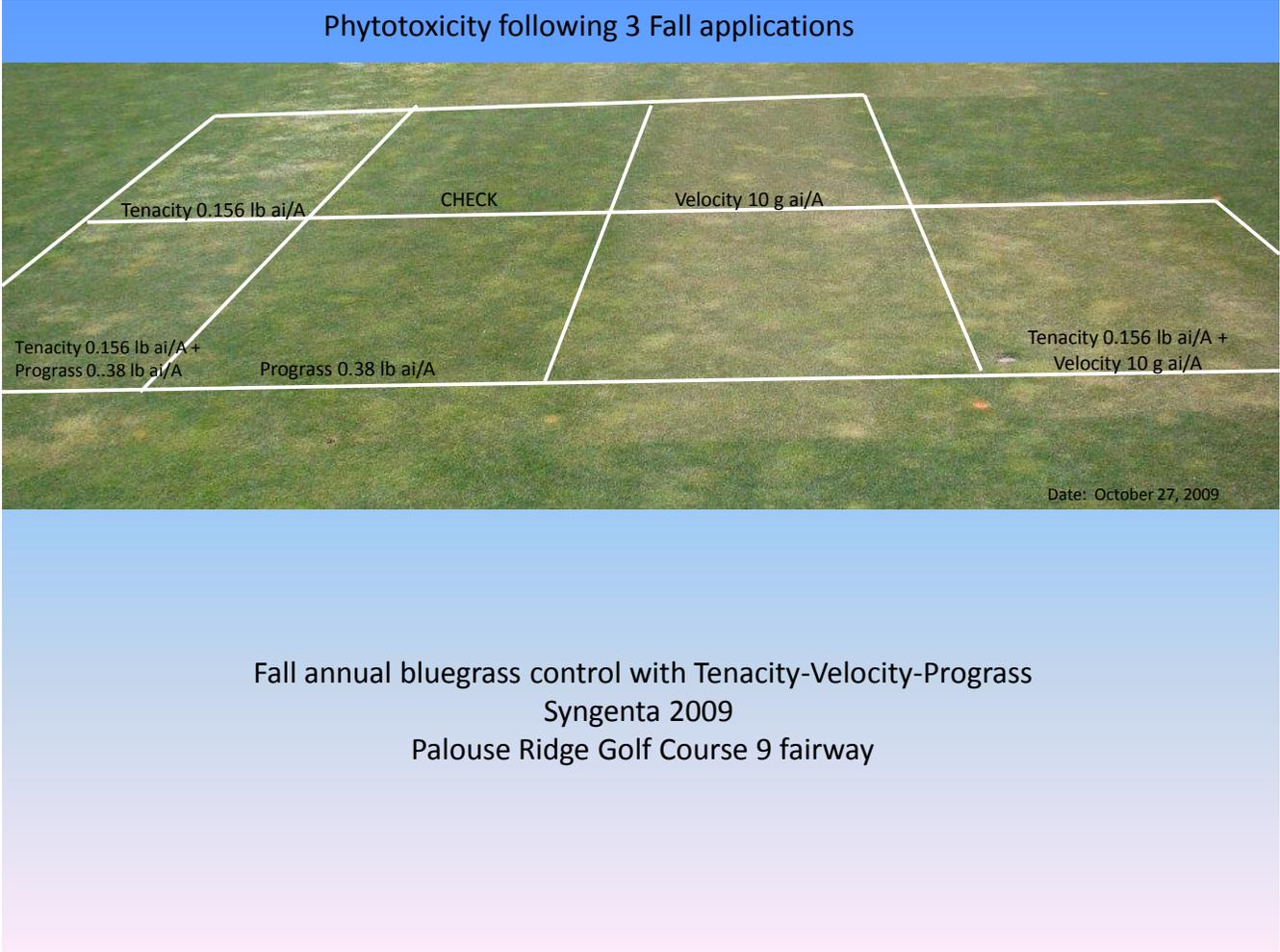


Fig. 2. Tenacity with Prograss treatment on 14 Apr. 2010. The light tan areas within the plot is dead *P. annua*. Palouse Ridge Golf Club at WSU 9 fairway.



Fig. 3. Close up of the matted dead leaf tissue of *P. annua* on 14 Apr. 2010. Palouse Ridge Golf Club at WSU 9 fairway.

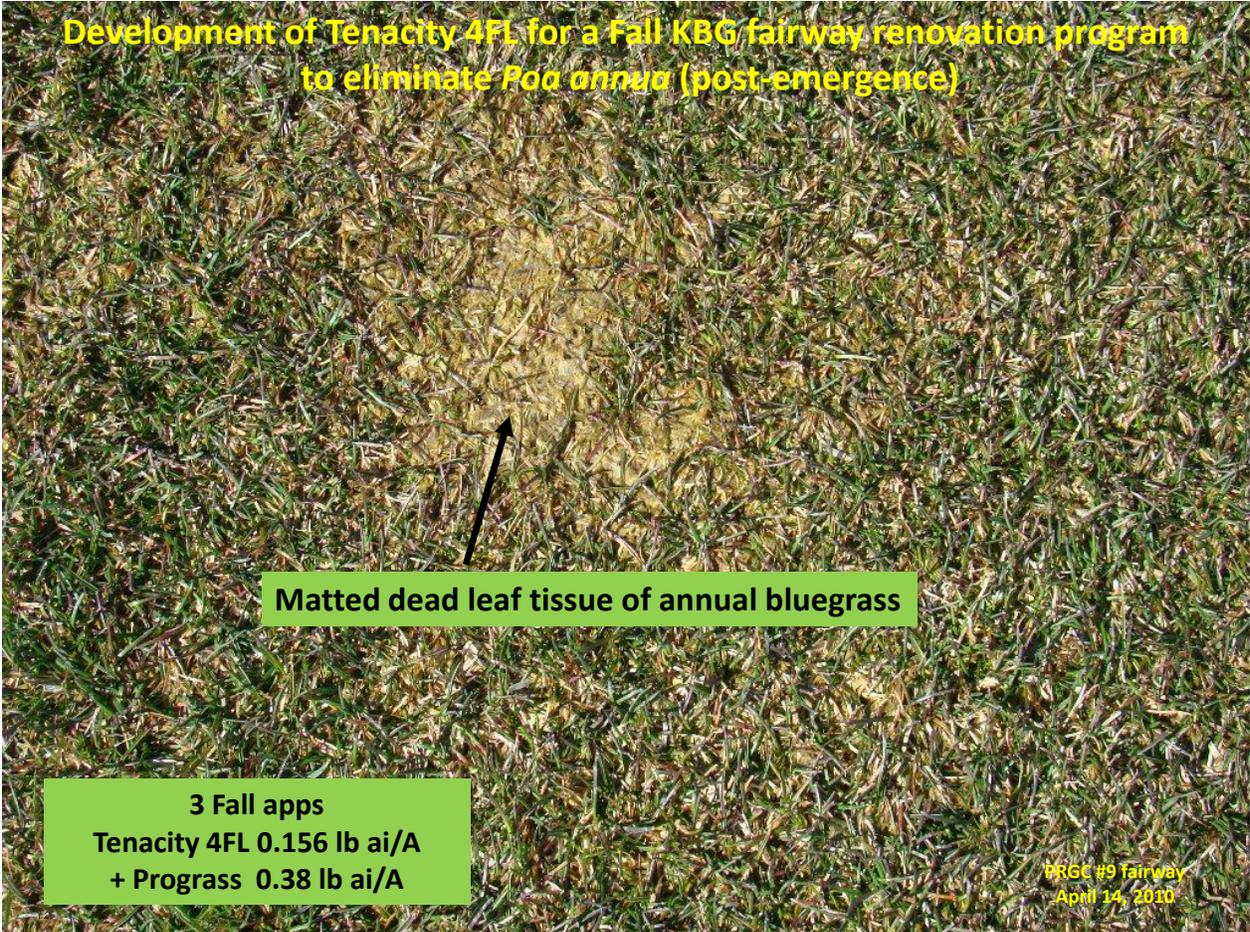


Fig. 4. Overview of the treatments in rep 1 on 14 Apr. 2010. The light tan areas in the Tenacity with Prograss treatment are areas of dead *P. annua*. Palouse Ridge Golf Club at WSU 9 fairway.

