Two consecutive years of multiple Fall applications of Tenacity and other grass weed herbicides for selective post-emergence *Poa annua* suppression in Kentucky bluegrass (*Poa pratensis* L.) fairways

Syngenta Protocol#: no number with this project

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December 6, 2011

A 2-year study was conducted at the WSU Palouse Ridge Golf Club (PRGC) in Pullman, WA to determine the efficacy of multiple Fall applications of mesotrione ('Tenacity') alone or combined with other grass weed herbicides, ethofumesate ('Prograss') or bispyribac-sodium ('Velocity'), for post-emergence control of *Poa annua* in a Kentucky bluegrass fairway. Treatments were applied three times in 2009 on 22 Sept., 7 Oct., and 19 Oct. and three times in 2010 on 16 Sept., 4 Oct., and 18 Oct. Additionally, in the Fall of 2010, prodiamine ('Barricade') was applied at 1 lb/A to the entire research area on 8 Sept. 2010. Phytotoxicity on Kentucky bluegrass and *P. annua* was rated once every week, or two, up to 2 Dec. 2009 and 2 Nov. 2010. Phytotoxicity was rated from 0 to 10; with 0 = no phytotoxicity and 10 = dead turf. The percentage of *P. annua* within each plot was determined at various times throughout the following growing seasons. Turfgrass quality (2010 data only) was rated from 1 to 9; with 9 = excellent.

Following the Fall applications, in both years, Velocity 2 oz/A alone or tank mixed with Tenacity 5 fl oz/A resulted in phytotoxicity to Kentucky bluegrass, however, the phytotoxicity was more severe in 2009 compared to 2010 (Figs. 1 and 2). It is unclear why there was such a difference between years but, perhaps the application of Barricade 1 lb/A early in September 2010 had something to do with the reduced response in 2010. Tenacity 5 fl oz/A + Prograss 32 fl oz/A or Prograss 32 fl oz/A also cause some phytotoxicity but, that occurred later and to a lesser degree. Fig. 3 shows phytotoxicity observed on Kentucky bluegrass treated with Tenacity + Velocity compared to Tenacity + Prograss.

All treatments except Prograss 32 fl oz/A alone caused considerable phytotoxicity to *Poa annua* (Figs. 4 and 5). Tenacity 5 fl oz/A resulted in the highest levels of phytotoxicity on *P. annua*. Surprisingly, tank mixing Tenacity 5 fl oz/A with Prograss 32 fl oz/A resulted in less phytotoxicity compared to Tenacity 5 fl oz/A. Fig. 6 shows phytotoxicity on *P. annua* 3 weeks after initial treatment (WAIT) in the Fall of 2010 (year 2). In other studies, we have noted that when Tenacity has been tank mixed with other herbicides the phytotoxic effects are less compared to Tenacity alone treatments. Tenacity 5 fl oz/A + Velocity 2 oz/A or Velocity 2 oz/A resulted in similar levels of phytotoxicity on *P. annua* throughout the Fall in both years.

Tenacity 5 fl oz/A + Prograss 32 fl oz/A resulted in the greatest reduction of *P. annua* in the turfgrass stand over the 2 years of the study (Fig. 7). By the end of the study in September 2011, the Tenacity + Prograss treatment reduced *P. annua* in the stand by over 60% compared to the beginning of the study. The only other treatment that resulted in a net reduction of *P. annua* in the stand was Tenacity 5 fl oz/A (approx. 20% reduction). All other treatments resulted in a net increase in *P. annua* in the stand. It is interesting to note that by the end of the Summer, the percentage of *P. annua* increased each year regardless of treatment. Fig. 8 shows Tenacity 5 fl oz/A + Prograss 32 fl oz/A and Tenacity 5 fl oz/A treatments compared to the Check on 6 Jun. 2011 (year 2). It is difficult to tell whether the Fall 2010 Barricade 1 lb/A application had any effect since there was no non-treated Check. However, there appears to be similar trends in the change of *P. annua* in the stand each spring, therefore, applying Barricade in the Fall may not be beneficial (Fig. 7).

Turfgrass quality followed the same trend as *P. annua* reduction, in that, the greater the reduction of *P. annua* in the stand resulted in higher levels of turfgrass quality (Fig. 9). The highest level of turfgrass quality resulted with the

Tenacity 5 fl oz/A + Prograss 32 fl oz/A treatment, which had the highest reduction of *P. annua* in the turfgrass stand. Fig. 8 shows the difference in turfgrass quality between the Check, Tenacity 5 fl oz/A + Prograss 32 fl oz/A, and Tenacity 5 fl oz/A.

Overall, Tenacity 5 fl oz/A + Prograss 32 fl oz/A, over 2 consecutive years of multiple Fall applications, resulted in low levels of phytotoxicity to Kentucky bluegrass, moderate phytotoxicity to *P. annua*, highest reduction of *P. annua* (> 60%), and the highest overall turfgrass quality of all treatments by the end of this study. Tenacity 5 fl oz/A did result in a net reduction of *P. annua* in the stand, but by only 1/3 compared to the Tenacity 5 fl oz/A + Prograss 32 fl oz/A treatment. Tenacity 5 fl oz/A + Velocity 2 oz/A resulted in virtually no change in *P. annua* in the stand, while Prograss 32 fl oz/A, Velocity 2 oz/A, and the Check resulted in a 60 to 80% increase over the 2 years of the study. In addition, multiple Fall applications of Tenacity 5 fl oz/A + Velocity 2 oz/A or Velocity 2 oz/A did result in high levels of phytotoxicity to Kentucky bluegrass each year. All treatments except Prograss 32 fl oz/A resulted in considerable phytotoxicity to *P. annua* in the Fall of both years. *P. annua* increased in the stand by the end of the Summer, in both years, regardless of treatment. Since complete *P. annua* control was not achieved, it appears that continual Fall applications of Tenacity 5 fl oz/A + Prograss 32 fl oz/A will most likely be necessary to maintain the lowest levels (suppression) of *P. annua* in Kentucky bluegrass fairways compared to the other treatments in this study.

Furthermore, since both Tenacity and Prograss have pre-emergent activity it may be best to apply Barricade in the early spring or summer following Fall applications rather than applying it in the Fall prior to Tenacity + Prograss treatments. It would be interesting to see if this would have any effect on the increase in *P. annua* in the stand observed by the end of the summer.

Fig. 1. Phytotoxicity on Kentucky bluegrass following multiple Fall applications (year 1) of herbicides to control *Poa annua* in a Kentucky bluegrass fairway at Palouse Ridge Golf Club at WSU. Pullman, WA 2009.

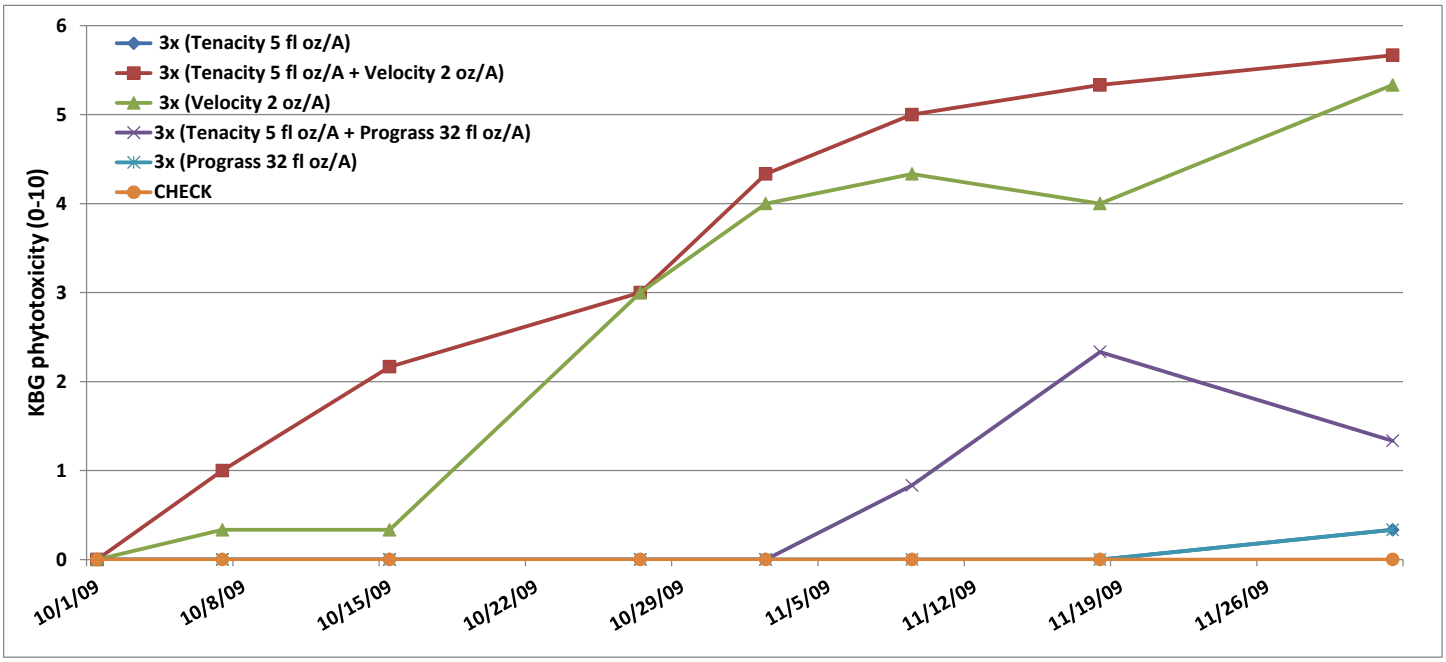

Fig. 2. Phytotoxicity on Kentucky bluegrass following multiple Fall applications (year 2) of herbicides to control *Poa annua* in a Kentucky bluegrass fairway at Palouse Ridge Golf Club at WSU. Pullman, WA 2010.

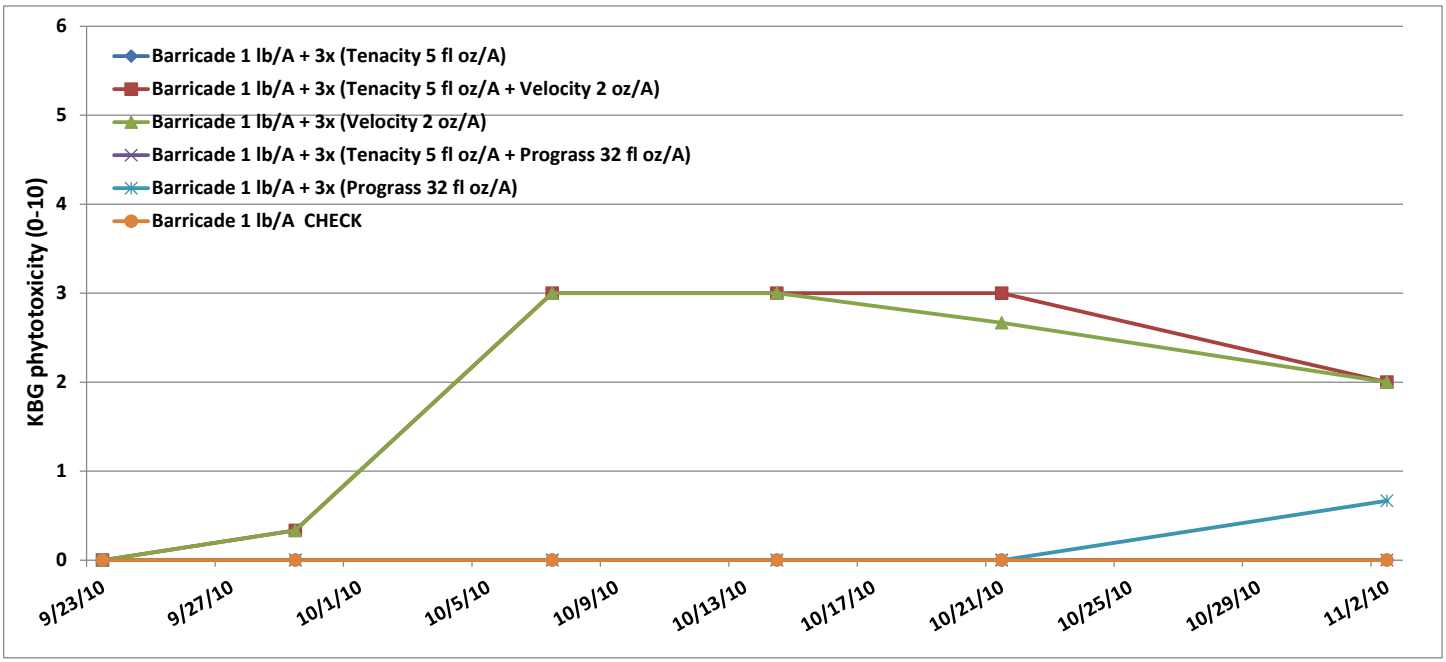

Fig. 3. Phytotoxicity on Kentucky bluegrass following multiple Fall applications (year 2) of herbicides to control *Poa annua* in a Kentucky bluegrass fairway at Palouse Ridge Golf Club at WSU. Pullman, WA 2010.

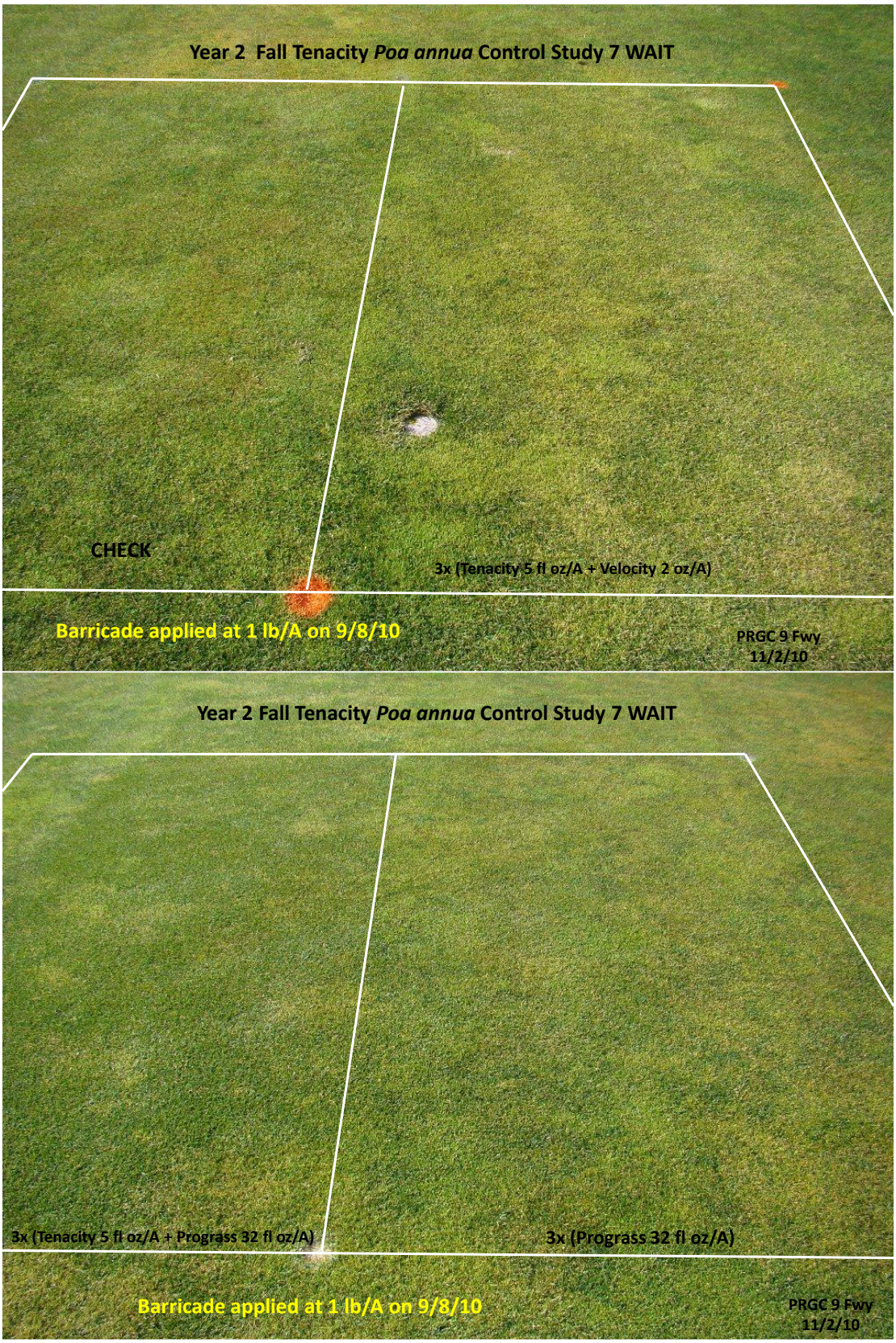

Fig. 4. Phytotoxicity on *Poa annua* following multiple Fall applications (year 1) of herbicides to control *Poa annua* in a Kentucky bluegrass fairway at Palouse Ridge Golf Club at WSU. Pullman, WA 2009.

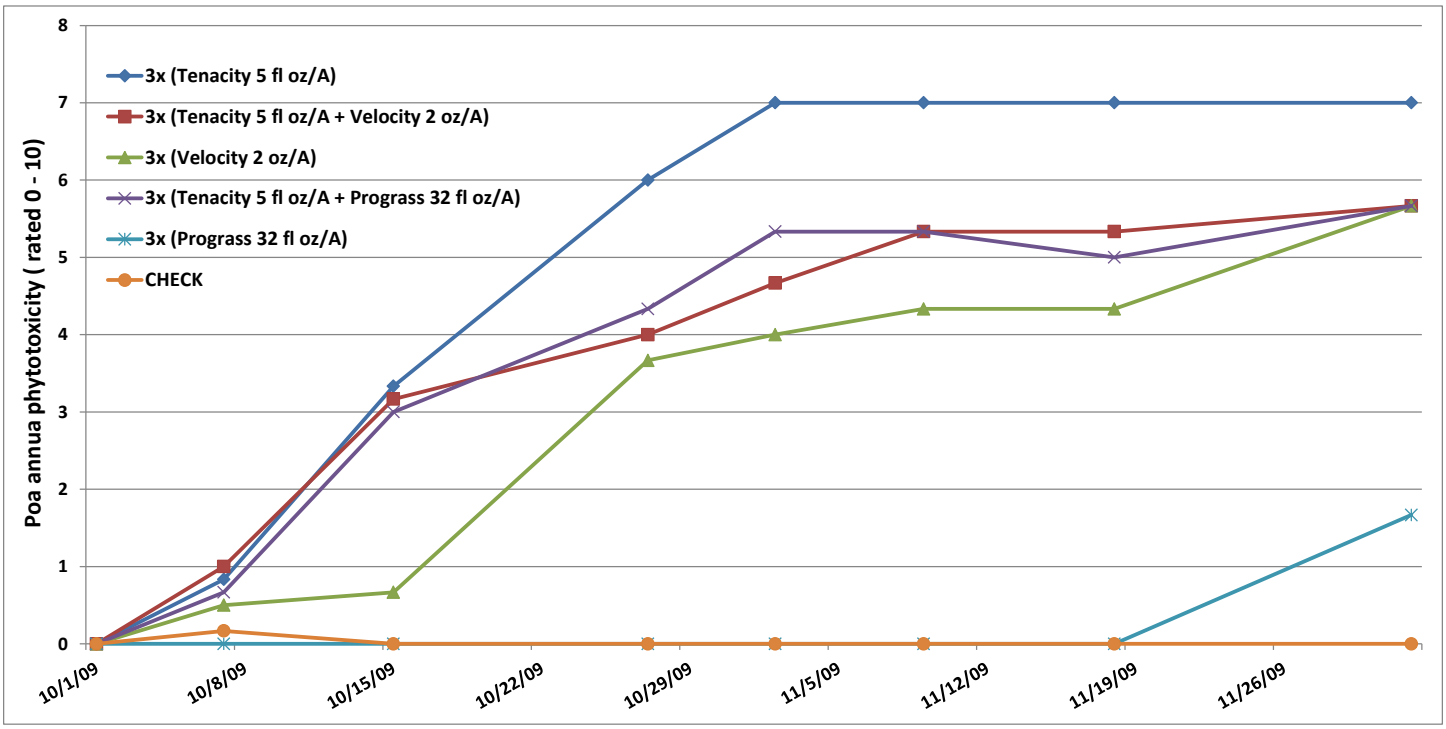

Fig. 5. Phytotoxicity on *Poa annua* following multiple Fall applications (year 2) of herbicides to control *Poa annua* in a Kentucky bluegrass fairway at Palouse Ridge Golf Club at WSU. Pullman, WA 2010.

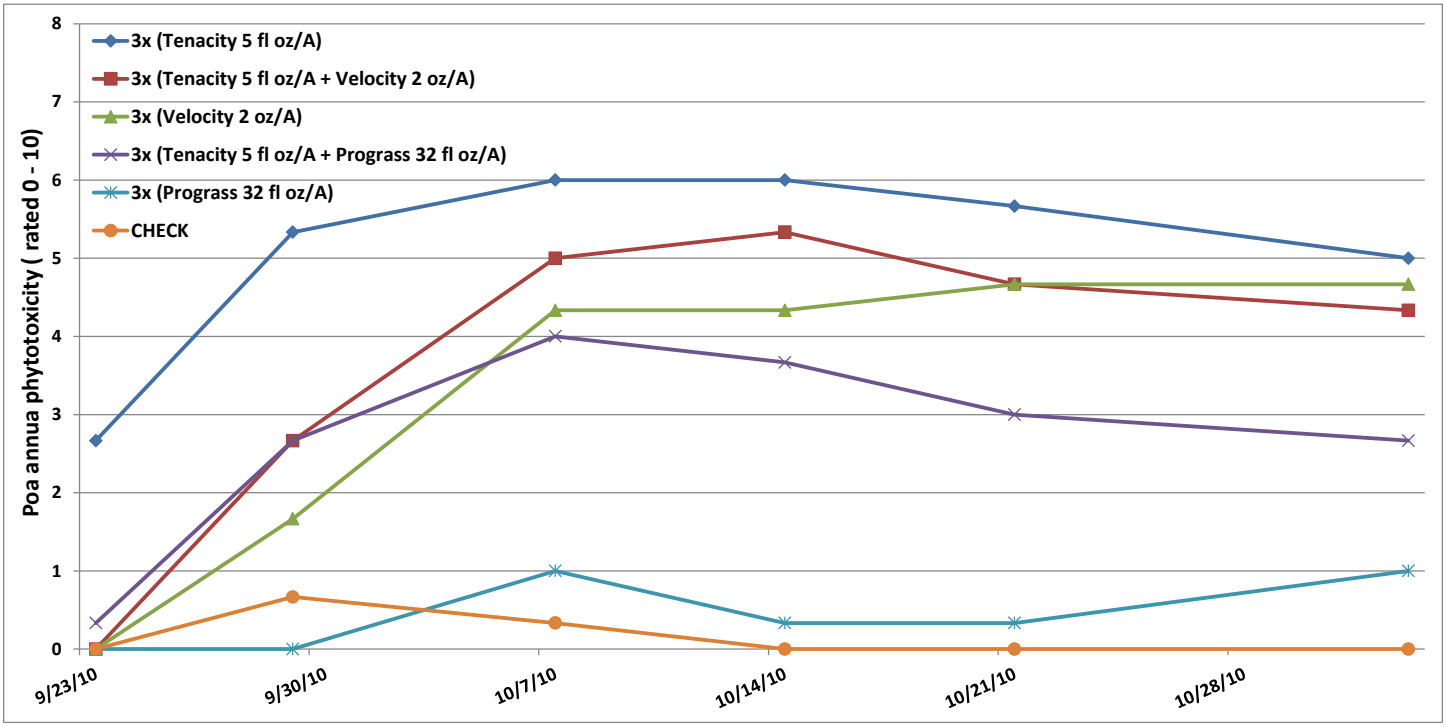

Fig. 6. Phytotoxicity 3 weeks after initial treatment (WAIT) on *Poa annua* following 2 Fall applications (year 2) of Tenacity to control *Poa annua* in a Kentucky bluegrass fairway at Palouse Ridge Golf Club at WSU. Pullman, WA 2010.

Fig. 7. Change in *Poa annua* in a Kentucky bluegrass fairway following 2 consecutive years of multiple Fall herbicide applications. Palouse Ridge Golf Club at WSU. Pullman, WA 2009-11.

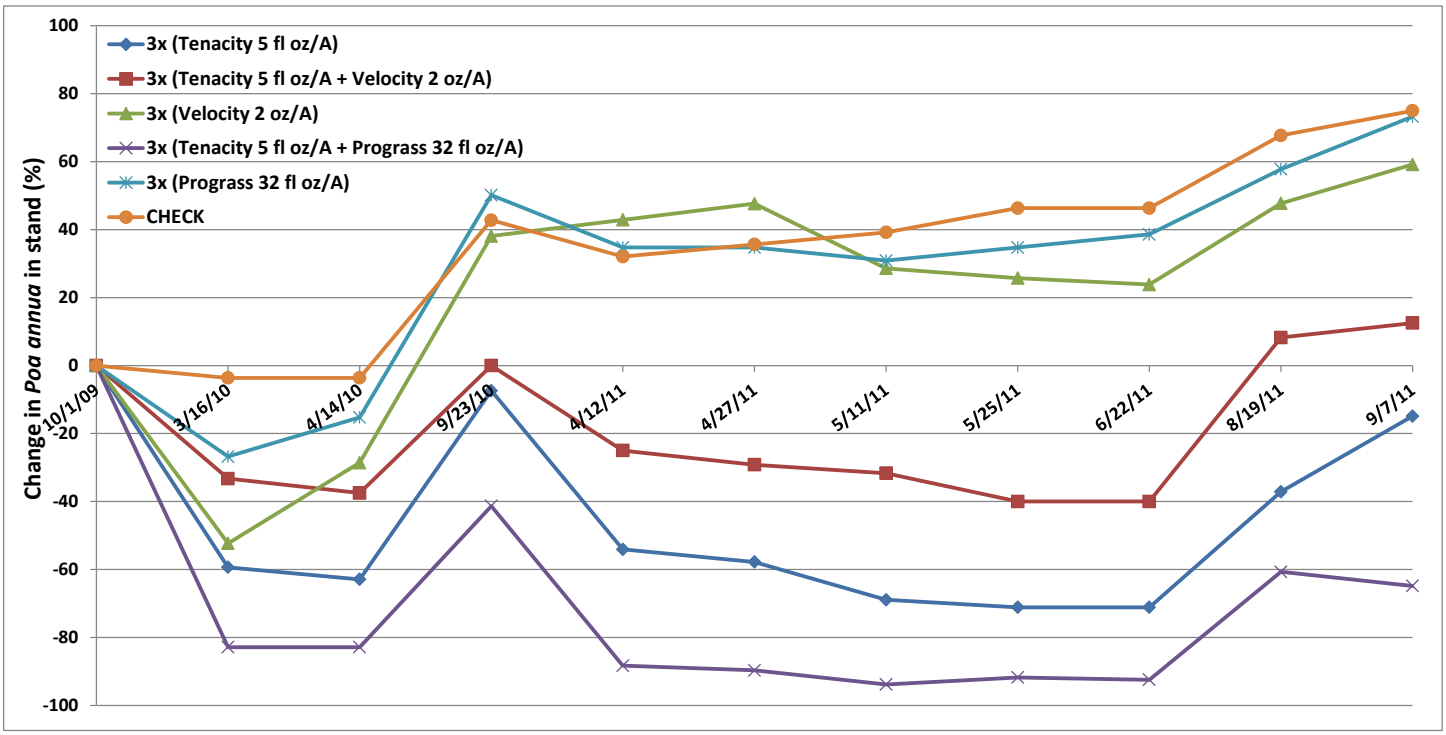

Fig. 8. *Poa annua* in a Kentucky bluegrass fairway, on 22 June 2011, following 2 consecutive years of multiple Fall herbicide applications (year 2). Palouse Ridge Golf Club at WSU. Pullman, WA 2011.

Fig. 9. Turfgrass quality in a Kentucky bluegrass fairway following 2 consecutive years of multiple Fall herbicide applications to control *Poa annua* (year 2). Palouse Ridge Golf Club at WSU. Pullman, WA 2011.