

Developing Weed Management Programs for Creeping Bentgrass Fairways Using Low Environmental Impact Herbicides

Matthew Elmore and James Brosnan
University of Tennessee



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Objectives:

1. : Reduce CBG injury from low environmental impact herbicides using herbicide safeners.

Despite widespread popularity, creeping bentgrass (*Agrostis stolonifera* L.) (CBG) is tolerant of few postemergence herbicides. This forces turfgrass managers to tolerate moderate injury from herbicides used to control graminaceous weeds or use more laborious methods of removal. Herbicide development is currently focused on providing superintendents with herbicides that pose minimal environmental impact and can be used effectively at lower application rates than older alternatives. However, few of these products are safe for use on CBG.

Turfgrasses naturally contain enzymatic systems to detoxify xenobiotics (synthetic chemicals within the plant). Selectively enhancing the ability of CBG, but not target weeds, to more rapidly detoxify herbicides would provide more versatile options for selective weed control.

In year one, topramezone and pinoxaden were determined to be good herbicide candidates for additional research. Cloquintocet-mexyl (cloquintocet) was most the effective safener in reducing CBG injury from topramezone. The safeners mefenpyr-diethyl (mefenpyr) and cloquintocet were most efficacious in reducing pinoxaden injury to CBG. Safeners rates were five times the amount of herbicide applied.

Experiments were conducted in year two were to determine if lower safener rates could reduce CBG injury from pinoxaden and topramezone and provide weed control.

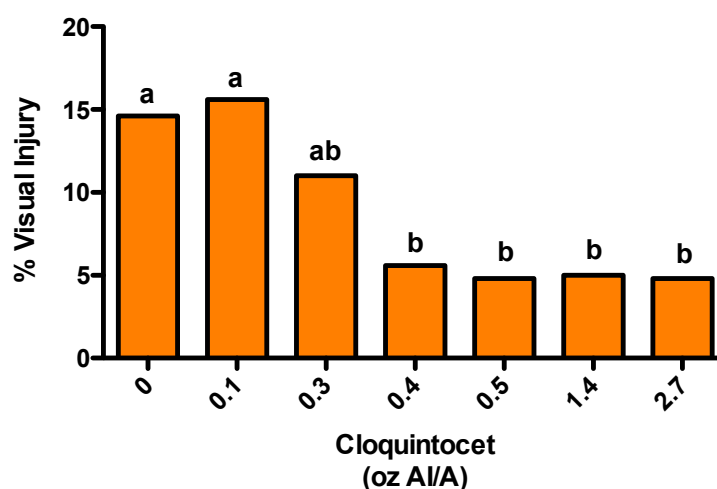
Reduced Safener Rates

The objective of 2013 experiments was to determine effects of cloquintocet and mefenpyr application rate on reducing CBG injury from topramezone and pinoxaden. Research was initiated

in greenhouses at the University of Tennessee (Knoxville, TN) on mature 'Penncross' CBG maintained at a 0.5" height in 2.5" cone-tainers filled with a peat moss, perlite, vermiculite growing medium. Treatments were applied with NIS at 0.25 % v/v and water (23 GPA) using a spray chamber.

Topramezone (0.53 oz AI/A) was applied alone and in combination with cloquintocet at 2.7, 1.4, 0.5, 0.4, 0.3 and 0.1 oz/A. Pinoxaden (1.3 oz AI/A) was applied alone and in combination with cloquintocet or

Figure 1. 'Penncross' creeping bentgrass (*Agrostis stolonifera*) visual injury 14 days after treatment with topramezone (0.5 oz AI/A) alone and in combination with various rates of the herbicide safener cloquintocet-mexyl. Treatments followed by the same letter are not significantly different (LSD, $\alpha=0.05$).



mefenpyr at 6.5, 3.3, 1.3, 1.0, 0.7 and 0.3 oz/A. CBG injury was evaluated visually on a 0 (no injury) to 100% (complete control) scale at 7, 14 and 21 DAT. Clipping yields were measured 21 DAT.

CBG injury from topramezone was reduced from 15% to 5% at 14 DAT by the addition of cloquintocet at > 0.4 oz/A (Figure 1). CBG injury from pinoxaden was reduced with increasing rates of both cloquintocet and mefenpyr (Figure 2). The addition of mefenpyr at 3.3 oz/A reduced pinoxaden injury from 21% to 1% at 14 DAT and increased clipping yield by over 100% (Figure 3). Cloquintocet and mefenpyr increased clipping yield compared to pinoxaden alone at all rates evaluated.

Weed Control Efficacy

The objective of these experiments was to determine if cloquintocet and mefenpyr reduced weed control with topramezone and pinoxaden. Safener rates were selected based on results of the previous experiment.

Treatments were applied to CBG and select weeds grown in 16.5" x 5.5" pots filled with Sequatchie silt loam soil. CBG and selected weeds were seeded into separate rows spaced 2 in apart. Treatments were applied 21 to 28 days after seeding using the same methods as in the previous experiment.

Bermudagrass (*Cynodon dactylon*), large crabgrass (*Digitaria sanguinalis*) and goosegrass (*Eleusine indica*) control and CBG injury were evaluated visually on a 0 to 100% scale 7 and 14 days after topramezone (0.53 oz

AI/A) was applied alone and in combination with cloquintocet at 0.4 and 1.5 oz AI/A. Cloquintocet did not reduce weed control provided by topramezone.

Perennial ryegrass (*Lolium perenne*) rough bluegrass (*Poa trivialis*) control and CBG injury were evaluated after pinoxaden (1.3 oz AI/A) was applied alone and in combination with cloquintocet and mefenpyr at 1.0 and 3.3 oz AI/A. Application of cloquintocet (1.0 oz AI/A) and mefenpyr (1.0 and 3.3 oz AI/A) reduced rough bluegrass control with pinoxaden, but had no effect on perennial ryegrass control (Figure 4). However, mefenpyr reduced CBG injury > 80% and reduced rough bluegrass control < 45%. Thus, mefenpyr and cloquintocet increased the selectivity of pinoxaden for rough bluegrass and perennial ryegrass in CBG.

Summary

- Creeping bentgrass injury from topramezone can be reduced by cloquintocet–mexyl without reducing large crabgrass, bermudagrass, and goosegrass control.
- Selectivity of pinoxaden for perennial ryegrass and roughstalk bluegrass in creeping bentgrass can be increased by the addition of mefenpyr–diethyl and cloquintocet–mexyl.
- More data regarding the efficacy of herbicide safeners in field experiments are needed.

Figure 2. ‘Pennncross’ creeping bentgrass (*Agrostis stolonifera*) 14 days after treatment with pinoxaden (1.3 oz AI/A) alone and in combination with the herbicide safener mefenpyr–diethyl.

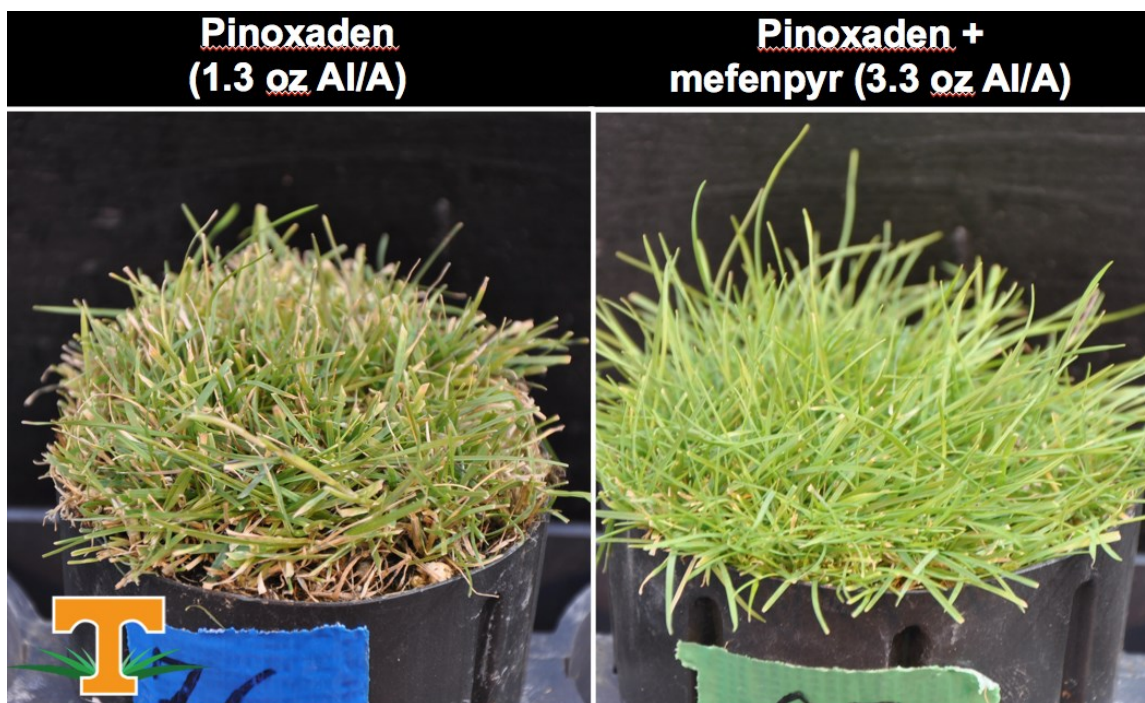


Figure 3. ‘Penncross’ creeping bentgrass (*Agrostis stolonifera*) clipping yield 21 days after pinoxaden (1.3 oz AI/A) application and various rates of mefenpyr-diethyl and cloquintocet-mexyl. Error bars indicate standard error of the mean.

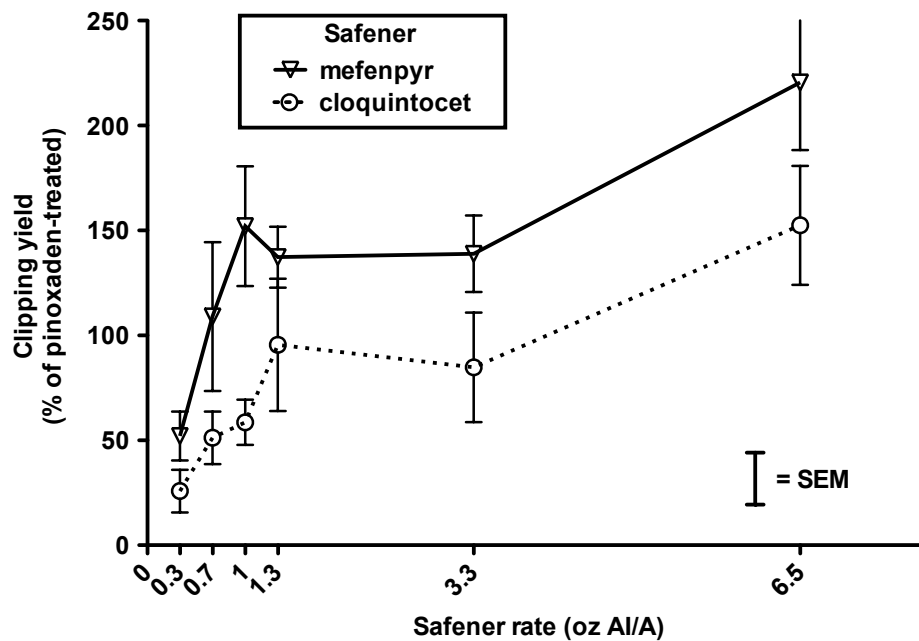


Figure 4. Control of ‘Penncross’ creeping bentgrass (*Agrostis stolonifera*), rough bluegrass (*Poa trivialis*) and perennial ryegrass (*Lolium perenne*) 14 days after pinoxaden application (1.3 oz AI/A) alone or in combination with mefenpyr-diethyl and cloquintocet-mexyl. Within each species evaluated, treatments followed by the same letter are not significantly different (LSD, $\alpha=0.05$). (Study 3).

