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A New Tool For *Poa Annua* Control in Turf

Poa annua (annual bluegrass) is a problematic winter annual weed that reduces turf aesthetics and functionality. Annual bluegrass has a bunch-type growth habit, light green color and abundant seedhead production. Additionally, *Poa annua* has poor stress tolerances and decline of populations in late spring reduces turf quality (Beard 1970; Lush 1989).

Postemergence herbicides are used in late winter or spring to control *Poa annua*, but populations resistant to specific chemistries may limit potential for successful control. Herbicide resistance in annual bluegrass populations may result from repeated use of the same herbicide or mode of action in consecutive years. Sulfonylureas inhibit acetolactate synthase (ALS), an enzyme in the biosynthesis of the branched-chain amino acids (LaRossa and Schloss 1984). Products like flazasulfuron (Katana), foramsulfuron (Revolver), and trifloxysulfuron

(Monument) are popular sulfonylureas used for postemergence annual bluegrass control in warm-season turfgrasses, but significant resistance issues have been reported in turf and other

crops (McElroy et al. 2013). Triazines inhibit photosynthesis by binding to D-1 proteins that transfer electrons from photosynthesis and form highly reactive free radicals (Devine et

al. 1993). Free radicals oxidize and destroy membranes and pigments, resulting in cell death in susceptible species. Extensive use of triazines has led to prevalent annual bluegrass resistance





in turfgrass in Georgia and other states. Glyphosate is a nonselective herbicide that inhibits 5-enolpyruvylshikimate-3-phosphate (EPSP) synthase that produces EPSP in the shikimic acid pathway (Amrhein 1980). Glyphosate is used for controlling annual bluegrass in dormant Bermudagrass, but overuse has also resulted in the spread of resistant populations throughout the southern U.S. Turfgrass managers should have an appreciation for the fundamentals of resistance management by utilizing herbicides with different modes of action in spray programs.

Flumioxazin is the active ingredient in SureGuard, a product labeled in 2011 for use in dormant bermudagrass. Flumioxazin has been extensively used in ornamentals and row crops including cotton and peanuts for annual weed control. Flumioxazin is a chlorophyll synthesis inhibitor similar to carfentrazone, oxadiazon, and sulfentrazone. In susceptible plants these herbicides inhibit the enzyme protoporphyrinogen oxidase (Protox). The inhibition of Protox leads to a toxic level accumulation of protoporphyrinogen IX that reacts with oxygen and light to form singlet oxygen resulting in rapid lipid peroxidation, membrane destruction, and eventual cell death. Protox inhibitors are not systemic herbicides, but are mainly used for annual weed control in turf.

Unlike other Protox inhibitors, flumioxazin provides post-emergence annual bluegrass control in dormant bermudagrass. In Georgia, flumioxazin applications are generally most effective in November and December, prior to annual bluegrass tillering. Applications at spring timings may also control *Poa annua* with residual control for summer annual weeds, including crabgrass and goosegrass (McCullough et al. 2012).

Currently, flumioxazin use is limited to dormant Bermudagrass since applications may cause injury to actively growing turf (Umeda 2012). Preliminary experiments at the University of Georgia show

Left: Flumioxazin (kept at 20 C) before and after 28 days of treatment. Above: Flumioxazin (kept at 10 C) before and after 28 days of treatment.

flumioxazin efficacy increases when temperatures are warmer in spring compared to winter timings. Flumioxazin also appears to be root absorbed and irrigation could maximize efficacy of applications. Our current research at the University of Georgia is evaluating the effectiveness of flumioxazin with adjuvants and tank-mixtures with other herbicides on mature annual bluegrass. We are also evaluating residual control of crabgrass and goosegrass following applications for postemergence annual bluegrass control and tolerance of five warm-season turfgrasses.

Overall, flumioxazin has potential as a new tool for annual blue-

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'Tifway' Bermudagrass untreated (left) and flumioxazin applied 2/1/13 at 0.375 lb ai a⁻¹ or 0.42 kg ai ha⁻¹, six weeks after treatment (3/14/13) (right) Shows *Poa* control on dormant Bermudagrass (green is annual bluegrass)

grass control in turf. Flumioxazin may provide a new mode of action for postemergence annual bluegrass control in turf, but end-users must understand that applications are limited to dormant Bermudagrass at this time and there are limitations on efficacy during winter months. For best results, read and follow label directions before use of any herbicide. GCI

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