Improving Weaknesses of Preemergence Herbicides

By Scott McElroy

Preemergence herbicides are the basis of effective weed management programs. By utilizing preemergence herbicides, one can prevent a problem before it begins. Whereas postemergence herbicides that are safe to the desirable turfgrass must be selected and applied during the correct environmental conditions to limit potential injury, preemergence herbicides are generally safe across all turfgrass species and can decrease the need to use a potentially damaging postemergence herbicide. In light of the industry's upcoming loss of MSMA, the value of preemergence herbicides will become even more important in the future.

The top four preemergence herbicides used in turfgrass are prodiamine, pendimethalin, dithiopyr and oxadiazon. These herbicides vary in the way they are used, chemical characteristics and behavior in the plant.

Prodiamine and pendimethalin are mitotic inhibiting herbicides within the dinitroaniline family. They are orange in color and were some of the first preemergence herbicides utilized in turf. They remain the standards of turfgrass management. Dithiopyr is similar to prodiamine and pendimethalin in that it inhibits mitosis; however, inhibition is at a slightly different site and dithiopyr can also inhibit shoot mitosis. Dithopyr also has the added benefit that it can control crabgrass (*Digitaria* spp.) postemergence before the plants tiller.

Oxadiazon has a completely different mode of action. Unlike these other preemergence herbicides, oxadiazon is a protox-inhibiting herbicide generating rapid cell degradation as a plant attempts to conduct photosynthesis. Oxadizon provides more broad-spectrum control, but it tends to be more expensive.

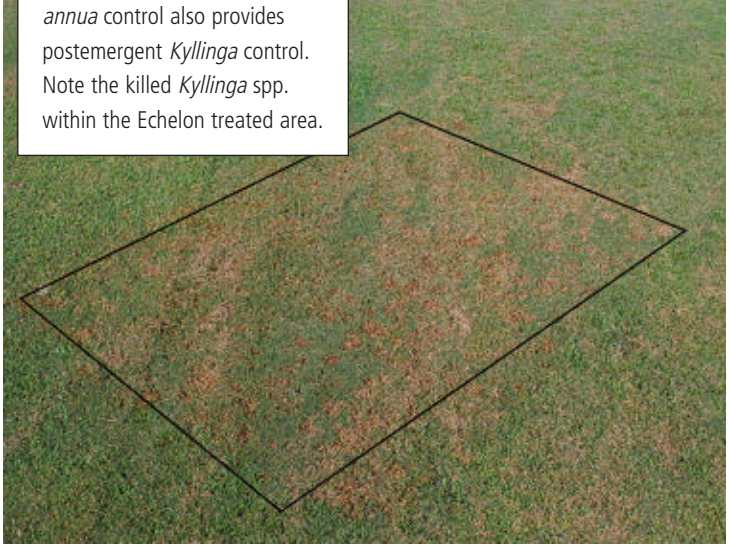
While these herbicides have many benefits, they also have some negative features. Prodiamine and pendimethalin primarily control annual grasses and small seeded broadleaf weeds. They do not provide preemegence control of a wide spectrum of broadleaf weeds and they offer limited control of sedges. Dithiopyr has a similar weakness in that it primarily controls annual grasses preemerge and provides little to no sedge control. Oxadiazon provides better preemergence control of some broadleaf weeds and sedges; however, it cannot be used in residential turf and it must be applied as a granule to dry turf to avoid potential injury.

To improve upon traditional herbicide performance, the following is needed:

- Improved control of broadleaf weeds.
- Improved sedge control.

A recently introduced herbicide active ingredient, sulfentrazone, addresses these needs and offers some potential benefits over traditional products. Sulfentrazone is a protox-inhibiting herbicide similar to oxidi-

Continued on page 62



Echelon applied for fall *Poa annua* control also provides postemergent *Kyllinga* control. Note the killed *Kyllinga* spp. within the Echelon treated area.

There are three benefits to Echelon that most traditional preemergence herbicides do not provide.

Continued from page 61

azon as a preemergent herbicide, but safe to apply as a postemergence herbicide as well. As a postemergence herbicide, sulfentrazone is fast-acting with control occurring within three days after treatment. It is primarily used to control sedge species postemergence, and is sold as Dismiss or Dismiss South (sulfentrazone plus imazethapyr) for enhanced purple nutsedge control.

Sulfentrazone has also been sold as mixtures with broadleaf herbicides (Q4 and Surge) to provide faster activity and as Solitaire (sulfentrazone plus quinclorac) for sedge, crabgrass and broadleaf weed control. Sulfentrazone is also unique in that it can potentially control goosegrass; ongoing research continues to demonstrate this added benefit.

Echelon is a prepackaged mixture of prodiamine and sulfentrazone developed to improve upon the weaknesses of traditional preemergence herbicides. Sulfentrazone has been used in row-crop agriculture for many years as an additive to dinitronaniline herbicides to improve preemergence sedge and broadleaf control. A similar type of control is expected and has been seen from Echelon.

As a professor at the University of Tennessee and now at Auburn University, I have conducted approximately 20 studies evaluating the usefulness of sulfentrazone in mixture with prodiamine (as is used in Echelon). In order to better understand its usefulness, it is easiest to simply compare Echelon to standard products.

First, from my data, Echelon offers similar control of crabgrass and *Poa annua* as traditionally used herbicides, such as Barricade. Both provide excellent control of these weeds when used at the proper rate; so if these weeds are your main target then either herbicide will work.

Having said that, there are three benefits to Echelon that most traditional preemergence herbicides do not provide. First, it provides added goosegrass control (Figure 1).

Goosegrass (*Eleusine indica*) is a later germinating annual grass species common in turfgrass. It typically germinates four to eight weeks after crabgrass germination. Using split application programs can improve goosegrass control, especially if Echelon is used as the second application.

A second benefit from this program is the added preemergence broadleaf control. Typically, this mixture of prodiamine and sulfentrazone is better for winter annual broadleaf weed control, such as henbit and common chickweed, than summer annuals, such as annual lespedeza. Similar to goosegrass control, split application programs that include an initial application of Echelon or a traditional preemergence herbicide followed by Echelon can improve control of annual and non-tuberous sedges, such as annual flat sedge (*Cyperus compressus*) and globe sedge (*Cyperus globulosus*). By using Echelon as the second preemerge application, sedges can germinate, thus allowing the product to provide pre- and postemergence activity. Echelon typically can provide burn back of these weeds, but control throughout the summer may dissipate.

A third benefit is pre- and postemergence sedge control (Figure 2). Similar to goosegrass control, split application programs that include an initial application of Echelon or a traditional preemergence herbicide followed by Echelon can improve control of annual and non-tuberous sedges. Using Echelon for the second application, sedges can germinate, thus allowing both pre- and postemergence activity. Echelon typically can provide burn back of these weeds, but control throughout the summer can dissipate.

The combination of prodiamine and sulfentrazone in Echelon brings some advantages to the turfgrass market for preemergence weed control. These benefits are best seen when Echelon is used in a split-application preemergence program as listed in Table 1.

As demonstrated in this article, Echelon provides similar benefits as traditional herbicides for general crabgrass and *Poa annua* control. However, it can improve weed control programs when used as a split application program for sedge and goosegrass control.

Scott McElroy, Ph.D., is an associate professor of turfgrass/weed science in the Department of Agronomy and Soils at Auburn University. He can be reached at jsm0010@auburn.edu .

Ad Index