

Mixing It Up

When it comes to tank mixing sulfonylureas, what you shouldn't do is clear

Scott McElroy and Greg Breeden

New sulfonylurea (SU) herbicides for use in turfgrass systems have revolutionized weed management in turf. Because of these new herbicides, such as Revolver (foramsulfuron), Monument (trifloxysulfuron) and TranXit (rimsulfuron), we now have options for some of our toughest weed control problems.

Weeds normally difficult to control — annual bluegrass (*Poa annua*), clumpy perennial ryegrass (*Lolium perenne*), yellow nutsedge (*Cyperus esculentus*) and *Kyllinga* spp. — can now be easily controlled in bermudagrass and zoysiagrass turf with these herbicides.

But while these herbicides can control many weeds, they are not the panacea that one would hope. For example, many SU herbicides will control some broadleaf weeds, but no one SU herbicide will control all broadleaf weeds. So for complete control of a broad range of broadleaf weeds, you may want to tank mix an SU herbicide with another herbicide to broaden your spectrum of weed control. But can you do this with out any antagonism occurring?

With regard to tank mixing SU herbicides with other herbicides to broaden the spectrum of weed control, we have some definite things we cannot do and there is much we simply do not know about tank mixing them. Let's start

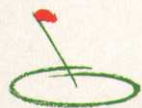
with what we know we cannot do.

There is only one definite "Do Not" with respect to tankmixing SU herbicides. Do not tankmix SU herbicides with the two herbicide families that only control grasses, cyclohexanediones and aryloxyphenoxy propionates, also know simply as graminicides (Table 1).

Herbicides in these families include Illoxan (diclofop), Fusilade II (fluazifop), Acclaim Extra (fenoxaprop), Vantage (sethoxydim) and Select (clethodim). There is firm evidence that indicates that tank mixing SU herbicides with graminicides will antagonize the activity of the graminicide. The activity of the SU herbicide will not be antagonized, however, so weeds targeted by the SU herbicide will still be controlled.

One potential problem that could arise would be the potential tank mixing of Monument for sedge control, and Illoxan for goosegrass control. Since Monument is an excellent herbicide for control of almost all sedges, including nutsedges (*Cyperus* spp.) and *Kyllinga* spp., you would observe excellent sedge control. Goosegrass control with Illoxan could be severely decreased, however, because of Monument antagonizing the herbicidal activity of Illoxan.

Continued on page 84



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TABLE 1

A list of common sulfonylurea herbicides and graminicides used in turfgrass and landscape systems.

Sulfonylurea Herbicides	Graminicides	
	Cyclohexanedione (-dims)	Aryloxyphenoxy propionate (-fops)
chlorsulfuron [Corsair]	clethodim [Select]	diclofop [Illoxan]
foramsulfuron [Revolver]	sethoxydim [Vantage]	fenoxaprop [Acclaim Extra]
halosulfuron [Manage]		fluazifop [Fusilade II]
metsulfuron [Manor]		
rimsulfuron [TranXit]		
sulfosulfuron [Certainty]		
trifloxysulfuron [Monument]		

Definitions of Herbicide Tank Mixture Effects (Vencill 2002)

Additive — An interaction of two herbicides would be considered additive when the observed weed control of the mixture is the combined effect of when the two herbicides are applied separately. Example: Product A and B each control crabgrass 50 percent, but when applied together they control crabgrass 100 percent.

Antagonism — An interaction of two herbicides such that the observed weed control when herbicides are combined is less than the weed control of the herbicides when they are applied separately. Example: Product A and B

each control crabgrass 100 percent alone, but when applied together only 20-percent crabgrass control is achieved.

Synergism — An interaction of two herbicides such that the observed weed control when herbicides are combined is greater than the additive effect of the herbicides when they are applied separately. Example: Product A controls crabgrass 10 percent and Product B controls crabgrass 20 percent. When they are combined they control crabgrass 100 percent, instead of an additive effect of 30 percent.

Continued from page 82

Research conducted at the University of Tennessee in 2004 evaluated this potential problem. Treatments included Illoxan at 43.5 fluid ounces an acre, Monument at 0.56 fluid ounces an acre and Revolver at 28 fluid ounces an acre, with Monument and Revolver also being applied in tank mixture with Illoxan.

All treatments were applied twice, with the second application being made two weeks after the first. The first applications were made on Aug. 6. Goosegrass plants were producing seed-heads at the time of application and contained from 8 tillers to 12 tillers. Ratings were taken three weeks after the second application.

As expected, Monument antagonized goosegrass control with Illoxan (Figure 1). In

this scenario, however, if Monument controlled goosegrass, the antagonism would not be noticed simply because the SU herbicide activity is not disrupted (Burke et al. 2003). This is illustrated by treating goosegrass with a tank-mixture of Revolver and Illoxan. While this tank mixture is equivalent to Revolver or Illoxan alone with respect to goosegrass control, the observed control is most likely attributed to the activity of Revolver on goosegrass as opposed to Illoxan.

This study illustrates the problem with tank-mixing SU herbicides with graminicides. Tank-mixing SU herbicides with other herbicide groups is not as clear-cut however.

Broadleaf herbicides

When determining if you can tank mix SU herbicides with those other than graminicides, our knowledge of what you can and cannot tank mix is a little murkier.

Many SU herbicide labels allow for tank-mixtures with broadleaf herbicides, such as 2,4-D, dicamba, clopyralid and triclopyr to broaden the spectrum of weed control. While there is currently no current research evidence available to suggest that one of these herbicides would be antagonized or would antagonize an SU herbicide, there is little evidence to suggest that antagonism does not occur. And while there have been isolated reports of antagonism from superintendents and other turf managers this year who have used such tank mixtures, there countless others who have not had a problem or who have actually seen potential synergism of tank mixtures.

Other herbicides that are commonly applied in tank mixture with other herbicides are MSMA and Quicksilver (carfentrazone).

FIGURE 1

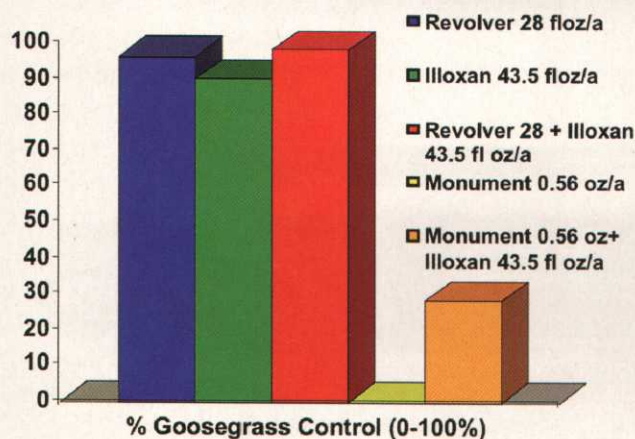
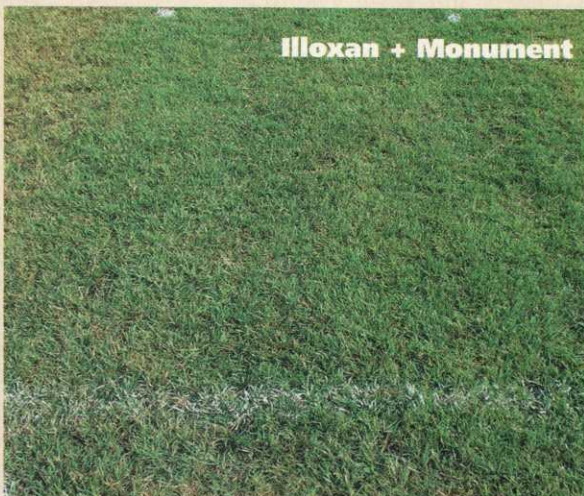


Figure 1. Goosegrass control with Revolver, Illoxan and Monument alone and in tank mixture. All treatments were applied twice with the second application applied two weeks after the first.

FIGURE 2

Goosegrass control with Revolver, Illoxan and a tank mixture of Illoxan + Monument. Note the high density of goosegrass in the treated plots. (Photographs taken one week after the second of two applications of each treatment.)



Again, isolated complaints of MSMA or Quicksilver antagonizing an SU herbicide have surfaced, but there is little evidence to suggest that these herbicide cause SU herbicide antagonism. To evaluate potential antagonism of one of these herbicides with an SU herbicide, a research trial was conducted at the University of Tennessee.

The trial evaluated Revolver, Monument and an unlabeled SU herbicide, flazasulfuron, for control of clumpy tall fescue in bermudagrass turf. Each of these herbicides are known to provide excellent control of tall fescue, however, in our study we applied each alone or in tank-mixture with 2,4-D, MSMA or quicksilver to determine if any of these herbicides antagonize tall fescue control.

In this situation there was no antagonism of any of the SU herbicides. All of the herbicide treatments evaluated controlled tall fescue from 85 percent to 100 percent, regardless if it was applied with one of the tank-mix herbicides or not.

This research was also conducted on tall fescue a second time to confirm the results and also on clumpy perennial ryegrass. In both of these additional cases, no antagonism of the SU herbicides was observed. Does this mean that there is no problem with tank mixing SU herbicides with these particular three herbicides? Not necessarily. There is still much research to be done to evaluate potential problems that may occur.

Final thoughts

New herbicides and other pesticides in the turfgrass market often bring great benefit in solving pest problems that once had few, if any, solutions. With new chemistry usually can come with potential unforeseen problems.

To avoid potential antagonism problems, remember always to consult the herbicide label on proper mixing instructions and tank mix partners.

Scott McElroy, Ph.D., is an assistant professor of turfgrass weed science at the University of Tennessee. He can be reached at mcelroy@utk.edu. Greg Breeden is an extension assistant in turfgrass weed science at the University of Tennessee.

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