New Tools for the Golf Course Superintendent

A practical user's guide to the sulfonylurea herbicides.

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Sulfonylurea herbicides (SUs) have been a relatively minor component of turf weed control on golf courses for many years. More recently, herbicides from this class of chemistry have been introduced at a rapid pace to the turfgrass management industry. This article will introduce the golf course turf manager to an evolving class of herbicide chemistry. Ultimately, it is the individual golf course superintendent who chooses the product that best fits the need.

THE BASIC CHEMISTRY OF THESE HERBICIDES

The very first practical herbicides were discovered in the early 1940s for broadleaf weed control. At that time, 2,4-D was a key player, and the early herbicides of the phenoxy group required high use rates to achieve weed control. Sulfonylurea herbicides were first discovered in the mid-1970s and were initially developed for use in wheat and barley. They are important in agricultural crops, but until recently they have played a minor role in the arsenal of weed killers for turfgrass managers. The first commercial use of an SU in agricultural crops was in 1982 (chlorsulfuron). This was followed by the first turf registrations with Scotts' DMC (metsulfuron) and Lesco's TFC (chlorsulfuron) in the early 1990s.

This class of chemistry was created to have significantly lower use rates, which is important in today's environmentally conscientious world. SUs were developed because of their ability to provide postemergence control of problem grassy weeds (monocots) in existing stands of turf at low active ingredient rates. The sulfonylureas, along with the imidazolinones, triazolopyrimidine, and pyrimidinyl oxybenzoates, are chemical classes that interfere with synthesis of the branched-chain (aliphatic) amino acids, referred to as ALS inhibitors.

These herbicides interfere with the activity of the chloroplast enzyme acetolactate synthase (ALS). This enzyme is vital to the formation of valine, leucine, and isoleucine, amino acids found only in plants. The enzyme is blocked, preventing development of essential amino acids and causing the plant to starve. The tolerant plants, including turfgrasses, typically are not injured and show no symptoms. Sulfonylurea symptoms include growth inhibition, chlorosis, and necrosis. Uptake occurs several hours after treatment, but symptoms may not be visible for one to two weeks. These herbicides are applied postemergence to weeds and are absorbed through the foliage and roots. Application rates are very low in this chemical class, typically an ounce or two of product per acre, with active ingredients measured in grams per acre.

These herbicides differ only slightly in chemical structure, but turf tolerance, safety, and weed control spectrum may differ substantially. Therefore, it is very important to understand the unique features of each product. Table 1 lists sulfonylurea herbicides labeled for use on golf courses.

Warm- and cool-season turfgrasses differ in their tolerance to SU herbicides. It is important that labels be read carefully and, when in doubt, contact the manufacturers or their technical representatives for specific recommendations. Both cultivars and environment can influence turf tolerance. The continued introduction of new cultivars further emphasizes the need to test the tolerance of these new grasses before the widespread use of any herbicide.

Why use this class of herbicide? In part, these products provide more weed control options than were available with other herbicides. For example:

- **Rogue Rye.** Mature clumps of perennial ryegrass look bad and play worse. These products provide superior control of this type of grassy weed compared to other materials.
- **Problem Weeds.** These materials help eliminate other difficult-to-control weeds, such as dallisgrass, sedges, and kyllingas, which are becoming more of a problem on golf courses each year.
- **Winter Weed Control.** The SUs offer an alternative to other chemistries, including Roundup (glyphosate), Princep (simazine), and Kerb (pronamide), for winter weed control. Christian Sain, golf course superintendent at Kingsmill Resort and Club (Williamsburg, Va.), reports that these products allow more flexibility in pesticide application timing. For example, through necessity, when overseeding one of their bermudagrass golf courses with ryegrass far later in the fall than normal, some *Poa annua* would have germinated prior to overseeding. The application of an SU product allowed them to control the *Poa annua* for a clean seedbed, resulting in much less *Poa annua* the following spring.
- **Spring Weed Control.** It is a common practice on non-overseeded

A sulfonylurea herbicide applied prior to fall overseeding of bermudagrass to ryegrass demonstrates its success when a missed strip obviously stands out.

bermudagrass and zoysiagrass to spray out winter weeds using products such as Roundup. Timing these sprays is always tricky. If sprayed early (in late winter), any possible damage to the warm-season grasses is minimized; however, this leaves time for weeds like *Poa annua* to germinate after the Roundup spray. By contrast, if the spray is applied later, in an attempt to try to control the spring germinating weeds and weedy grasses, this increases the possibility of damaging warm-season grass that may be breaking dormancy. With SUs, golf course superintendents now have the option of spraying early with products like Roundup, and then spraying a second time if necessary to control spring germinating weeds.

- **Postemergence Weed Control.** Depending upon the product, the SUs are labeled for the control of a long list of weeds in actively growing bermudagrass and other warm-season grasses, such as St. Augustinegrass and centipedegrass. Controlling kyllingas and other difficult weeds now becomes more manageable.
- **The Environment.** This unique chemistry of herbicides requires incredibly low use rates. Active ingredient rates are measured in grams per acre vs. ounces or pounds per acre for conventional herbicides. These products, as a group, have low dermal, inhalation, and acute toxicity to mammals, fish, wildlife, and pollinators, including honey bees.
- **Managing the Transition of Overseeded Ryegrass.** This useful herbicide chemistry allows superintendents to effectively manage the ryegrass transition by controlling the rate and time of application. Christian Sain noted that these products provide more weed control options. "The ability to control when the overseeded ryegrass dies out and the bermudagrass emerges is perhaps the greatest strength of this chemistry. In the North, cool springs often delay ryegrass transitions into early summer. All too often, by the time the ryegrass is gone, the bermudagrass barely has enough time to fill in and develop a healthy sod before it is time to overseed in the fall. I'm convinced this delay weakens the bermudagrass, especially in shaded and wet areas. I can now look at the calendar and count back at least 100 days from the time I plan to overseed in the fall and use that date to spray out the rye in the spring."

THE ONE-HUNDRED-DAY GUIDELINE

Turf managers across the U.S. are using the "100-day guideline" as the minimum amount of time needed for good bermudagrass growth prior to fall overseeding. Dr. Fred Yelverton, North Carolina State University, states, "Based on field observations where bermudagrass is overseeded with perennial ryegrass, it generally takes bermudagrass approximately 100 days to recover. Ground cover can be obtained in less than 100 days, but rhizome and stolon recovery will take about 100 days. We know this from overseeding removal trials where perennial ryegrass does not die out quickly enough for bermudagrass recovery. This is why I recommend a transition aide (herbicide) in areas where 100 days of bermudagrass growth without perennial ryegrass competition cannot otherwise be obtained."

POTENTIAL FOR TRACKING AND MOVEMENT

Many sulfonylurea herbicides are very safe on warm-season grasses. However, they can be lethal to cool-season grasses such as ryegrass, bentgrass, *Poa annua*, tall fescue, and *Poa trivialis*. The application of these herbicides in proximity to sensitive species, such as bentgrass putt-

Table I

Sulfonylurea herbicides labeled for use on golf courses.

Trade Name	Active Ingredient	Manufacturer	Labeled Turfgrasses	Weed Control Spectrum	Transition Aid	Unique Features	Ryegrass Overseeding Restrictions
Corsair	chlorsulfuron	Riverdale	bermudagrass, St. Augustinegrass, centipedegrass, zoysiagrass, bahiagrass	Various grass and broadleaf weeds			
Revolver	foramsulfuron	Bayer Environmental Science	bermudagrass and zoysiagrass	Annual and perennial cool-season grasses, including *Poa annua* and goosegrass	Yes	dallisgrass suppression	2 weeks
Manage	halosulfuron	Monsanto	Numerous cool- and warm-season grasses	Yellow and purple nutsedge, kyllinga	Yes		
Manor	metsulfuron	Riverdale	Kentucky bluegrass, fine fescue, bermudagrass, St. Augustinegrass, zoysiagrass, and centipedegrass	Annual and perennial grasses and broadleaves	Yes	bahiagrass control	
Certainty	sulfosulfuron	Monsanto	bermudagrass, St. Augustinegrass, zitsuagrass, centipedegrass, kikuyugrass	Annual and perennial sedges, grass and broadleaf weeds		Johnsongrass control	7-10 days, but not in southwestern U.S.
Monument	trifloxysulfuron	Syngenta	bermudagrass and zoysiagrass	Sedges, grasses, broadleaf weeds, and kyllinga	Yes	Torpedograss suppression, dichondra control	6 weeks
TranXit GTA	rimsulfuron	DuPont	bermudagrass, zoysiagrass, centipedegrass (temporarily suppresses Tifway bermudagrass)	Annual and perennial cool-season grasses, including *Poa annua*	Yes		

ing greens, on an otherwise bermudagrass golf course should be made under conditions that minimize the potential for drift, tracking, and soil movement (if the product has soil activity). The bottom line is to know your product and read the label before making an application.

IN CONCLUSION

This chemistry of herbicides has been around for a long time, but through a combination of factors, sulfonylurea herbicides are just now becoming a significant part of the weed control arsenal. Although these products may be similar chemically, they vary widely in their safety and utility on different grasses. As with all products, care should be taken to study the conditions at hand and select the least toxic product available to control a pest problem.

FOOTNOTE

The primary emphasis of this article is the option for using the sulfonylurea chemistry of herbicides on warm-season grasses, primarily bermudagrass. It should be noted that other products from this and related groups can be used on cool-season grasses. This underscores the uniqueness of these materials. Monsanto's SU (sulfosulfuron) and Velocity (bispyribac-sodium) can be used on cool-season grasses for weed control, including difficult-to-control weed grasses like *Poa annua* and *Poa trivialis*. Velocity is an ALS inhibitor but not a sulfonylurea, although it acts like one. Space does not allow for complete discussion of this equally exciting aspect of weed control. Contact the individual manufacturers, their technical representatives, state university extension personnel, or your regional USGA agronomist for more information.

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