

Update: Sulfonylurea Herbicides for Improved Transitions

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Bottom line: At this time last year, data had just started coming in on the performance of sulfonylurea (SU) herbicides for use in rye/*Poa trivialis* removal from overseeded fairways. While their performance was very positive in a number of locations, there were still many unanswered questions at the end of the summer regarding optimal use patterns. We now know that the bulk of SU herbicides are safe for use on bermudagrass, zoysia and centipedegrass, but can cause significant yellowing on other warm season grasses such as paspalum and kikuyugrass. Soil movement for most is moderate, which means that significant rainfall or irrigation immediately after application can cause damaging run-off into nearby cool season turf areas. Optimal application timing is roughly when warm season turf cover is greater than 70% -- later in the spring than originally thought. And it appears that SUs may have value as a gradual remediation tool for warm season turf has been weakened by partial shade or multiple years of overseeding. Overall, these products are useful tools that allow turf managers to remove cool season overseeds before the hot weather does, thus encouraging stronger and earlier growth of warm season turf.

In the last few years, a spate of new weed control products, all classified in the sulfonylurea (SU) group, have appeared in the marketplace – there are 6 registered, or about to be registered in the turf market alone. Primarily developed as cool season grass control products, a brief description of these products appears in Table 1 below.

In a previous issue of *PACE Insights* (volume 8, number 7), we described the potential of the SUs for removal of overseeded turf from warm season turf, and for promoting better springtime transitions. Now that more field data is available from around the country, we will update what is known about the SUs and their utility in golf course turf management.

What they are, and what they aren't

What the sulfonylurea herbicides can do:

- Remove rye before it's time: the SUs remove cool season turf (rye and *Poa trivialis*) from overseeded fairways earlier, and more completely than Mother Nature (in the form of warm weather) will. Once the overseed is removed, the underlying warm season turf has full access, without competition, for sunlight, nutrients and water, and thus transitions more rapidly.
- More control: SUs allow superintendents to have more control over when overseed removal takes place (and when the yellowing and browning associated with it occurs). This allows you to prepare and educate golfers and managers about the possible side effects of application (see below)
- Gradual remediation: with multi-year applications, the SUs have the potential to gradually remediate warm season turf stands that have been weakened by partial shade, overseeding, etc.
- Weed control on non-overseeded turf: These products are good at removing rye clumps, *Poa annua* and other weeds from non-overseeded fairways.

Figure 1. Effect of last year's SU application on this year's bermudagrass density. The effects of an application of the sulfonylurea herbicide, Revolver, in May of 2002, was still having positive effects a year later, on 6/4/03 when this photo was taken. Note the higher density of bermudagrass (50%) vs. the non-treated plot (10%). Similar results occurred with Manor, and are likely to occur with other SU herbicides.



What the sulfonylurea herbicides can't do:

- Avoid the yellowing and browning that occurs when rye and *Poa trivialis* start to die. When springs are warm, the period of yellowing and browning will be relatively brief (2 - 3 weeks). But when springs are cool (less than average air temperatures of 70F) or applications are made to shady or stressed areas, this "ugly" period can last 4 – 8 weeks.
- Avoid bare patches from occurring. Every golf course has some areas where warm season turf is either non-existent or very weak. After the overseed is removed – either by SU applications or by heat – these bare areas will become painfully obvious – at least until the warm season turf fills in.

We have provided information below to support the general conclusions above. Overall, we believe that these products can be useful tools in turf

management, but that the side effects -- of yellowing and browning turf, and the possible appearance of bare patches -- should not be ignored.

Long term benefits

Can the use of SU herbicides over a period of two or more years gradually improve the strength and density of warm season turf stands? Our field trials (Figure 1) at Morgan Run Golf Club (Kevin Kienast, superintendent) over the past year suggest that this may indeed be the case. By removing the overseeded cool season turf in the spring, the underlying bermudagrass has less competition during the critical spring transition period, is able to establish more rapidly, and as a result can enter the winter season with a denser and stronger stand. This allows the warm season turf to come back faster during the next spring, as seen in Figure 1. It's important to note that the photo in Figure 1 was taken in June of 2003, and that the last application of an SU herbicide had been made one year ago. In other words, the effects seem to be long lasting, or even perhaps (hopefully) permanent.

While more data is needed to confirm our observations, there is a good chance that SU

herbicides can help remediate stands of warm season turf that have been weakened by multiple years of overseeding, partial shade or other stressors. The warning here is not to expect the moon from these products. While they may help rejuvenate warm season turf that is mildly stressed, they are probably not going to be able to make warm season turf grow where it doesn't want to grow – in heavily shaded areas, for example. Also, if you are applying these products in areas of weakened warm season turf, you should expect significant yellowing and bare patches to occur as the cool season turf dies out.

Turf safety

Table 2 summarizes the turf safety data for the sulfonylurea herbicides. The majority of this information appears on the product labels; however, in some cases, the data has been gleaned from PACE or other university field trials. As always, if you are in doubt about the safety of a product for your turf, try some out on a small area and wait 1 -2 weeks to observe any signs of phytotoxicity.

Table 1. Sulfonylurea herbicide products for use on golf course turf. Note that the time interval between product application and overseeding (**Overseed interval**) varies dramatically among products; products with longer overseed intervals can decrease your flexibility in timing overseeding.

Product (active ingredient)	Company	Regulatory Status*	Target weeds	Overseed interval	Comments
Corsair (chlorsulfuron)	Riverdale	Registered in most states; Not for use on greens	Perennial rye, tall fescue, many broadleaf weeds	More than 60 days	Inconsistent performance in high organic matter soils**
Manor, Blade (metsulfuron)	Riverdale PBI/ Gordon	Registered in most states; Not for use on greens	Perennial rye; bahiagrass, foxtail, broadleaf weeds	60 days	Movement in soil increases at pHs > than 6
Monument (trifloxsulfuron)	Syngenta	Not currently registered	Perennial rye, <i>Poa annua</i> & <i>trivialis</i> , sedges, kyllinga,	Less than 30 days	Registration expected 2004; good for sedge and kyllinga control
Revolver (foramsulfuron)	Bayer	Registered in most states	Perennial rye, <i>Poa annua</i> & <i>trivialis</i> , goosegrass	10-14 days	
TranXit (rimsulfuron)	Griffin	Registered in most states; Not for use on greens	Perennial rye, <i>Poa annua</i> & <i>trivialis</i>	10 – 14 days	High price may limit acceptability
Velocity (bispyribac-sodium)	Valent	24c emergency registration in Michigan only	<i>Poa annua</i> removal on bentgrass fairways		

* Always check the registration status of these products in your state prior to use. ** The PACE database of soils from over 1600 fairways indicates that more than 60% of the fairways surveyed had organic matter contents >4%.

Table 2. Safety of SU herbicides for warm season turf varieties. S = safe, according to manufacturer's label; M = minor yellowing may occur; D = significant yellowing or damage may occur; ? = safety not yet determined. The DNA herbicide Kerb is included for the purpose of comparison. Always check product labels prior to application to confirm turf safety information, and to insure compliance with labeled rates and use patterns.

	Bermuda	Centipede	Kikuyu	Paspalum	St. Augustine	Zoysia
Corsair	S	M	?	?	M	M
Kerb	S	S	?	S	S	S
Manor	S	S	?	?	S	S
Monument	S	D	?	D	M	S
Revolver	S	D	D	M	M	S
TranXit	S	S	?	D	?	S

Soil mobility and tracking

The SU herbicides generally have moderate levels of mobility (lateral movement) in soil. This means that excessive irrigation or rainfall immediately after application may cause the products to run off into sensitive areas such as cool season roughs or greens (especially when they are in low spots), where herbicide damage will occur. Avoiding run-off is a bit tricky, since some of the SU labels (TranXit, Corsair) call for post-treatment irrigation. If you are concerned about these products moving onto sensitive cool-season turf areas, the best option is to rely on products that do not require post-treatment irrigation for best results (Revolver, Manor). But even with these products, you need to watch for rain forecasts and irrigation scheduling. If you must irrigate, the manufacturers of TranXit and Corsair recommend very short bursts of irrigation (try not to exceed 3 – 5 minutes or 1 - 2 turns of the heads) to help decrease the chances for run-off.



Tracking, or the movement of herbicide residues via foot traffic or equipment, is a related problem. With all SU products, wait until sprays have thoroughly dried (usually at least 4 hours or more) before allowing foot or vehicular traffic into the area.

Timing

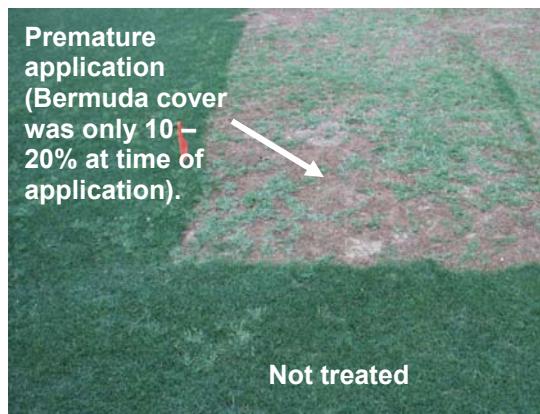
Deciding when to use SUs for removing overseeded turf is one of the most difficult aspects of using these products. If you apply too early in the springtime, when the warm season turf base is still weak and represents less than 70% of the turf cover, the result will be a combination of bare patches of ground, yellowing or dying ryegrass and a sprinkling of patches of green bermudagrass. While the bermudagrass will slowly fill in the bare areas, the turf quality in the interim might be unacceptable (Figure 2). This is more of a problem when springtime temperatures are cool (less than average air temperatures of 70F) because the warm season turf takes longer to fill in under these conditions.

If you apply too late in the year, the majority of the overseed will probably already be killed by heat and/or drought, and your application will have little or no effect.

The timing problem is compounded by the fact that there can be a lot of variation in warm season turf cover, even on one single golf course. Shady or stressed areas will likely have less warm season turf, while sunny areas will have more.

If you are going to err on timing the SUs, you are certainly better off erring on the side of being too late with your application, rather than too early. Too late will potentially result in a wasted application, but too early can cause significant and relatively long lasting decreases in turf quality.

Figure 2. Timing: avoid jumping the gun. When SU herbicides are applied too early in the season, the results will be unacceptable. If temperatures are cool (less than 70F average air temperature), it can take several weeks for the bermudagrass to fill in. The untreated areas in the photo below contained only 10 – 20% bermudagrass at the time of application. The photo was taken 4 ½ weeks after treatment.



So how do you decide when to apply? There are at least three strategies to consider, each of which has its pros and cons (Table 3). Based on what we know today, monitoring the growth and coverage of warm season turf is probably the easiest and least

risky way to time SU applications. When warm season turf is actively growing and constitutes 70% turf cover or more, SU applications will have their greatest benefit and will cause the shortest period of unsightly turf. But even with this guideline, there are a few things to watch out for. First, most people are delusional about how much warm season turf they actually have (they usually think they have more than they really do), and as a result, are unpleasantly surprised to find an unacceptable quantity of bare and thinning spots after SU applications. So, be really conservative in your estimates on warm season cover, and really examine the turf – if necessary with a hand lens, to make sure that you're not fooling yourself. Another way to confirm the level of warm season turf cover is to spray an SU product in a small area, and wait 1 - 2 weeks for the cool season overseed to die. At that point, you can make a good assessment of how much warm season turf is present – at least in that particular location on the course. A second and related watch-out is that on any given date, different areas of the golf course will have varying levels of warm season coverage. Shady areas and other stressed areas are likely to have lower warm season coverage, and areas dominated by common bermudagrass are also likely to be slower to fill in and begin active growth (Figure 3). You may need to schedule SU applications a few weeks later in shady areas, common bermudagrass areas, or other areas where warm season turf densities are lower.

Figure 3. Effect of turf variety and % turf cover on results. SU herbicides were applied on 5/7/03, and this photo was taken 3 weeks later, on 5/28/03. The white arrow points to an area that had 70% hybrid bermuda cover at the time of application. Note that this treated turf is almost 100% bermudagrass 3 weeks later, while the non-treated turf below is still a combination of bermudagrass and ryegrass. The yellow arrow points to an area that had 40% common bermuda cover at the time of application. The slower growth rate and less dense cover of the common bermudagrass are responsible for the patchy appearance of the turf.



Table 3. The pros and cons of three timing strategies for sulfonylurea herbicides

STRATEGY	Explanation	Pros	Cons
1) Turf cover estimates	Applications made on the basis of percentage warm season turf present. At least 70% warm season turf (80% if common bermuda) is probably necessary for optimal results.	Visual assessment of warm season turf cover percentages requires no special tools, and is the actual measurement that we are most interested in.	Accurate measurement of percentage warm season turf cover is difficult to make. Most people overestimate the amount of warm season turf present, which leads to premature application of SUs.
2) Calendar-based	Applications made on the same date every year	Easy scheduling and decision making	The date on which warm season turf achieves > 70% cover and is actively growing can vary markedly from one year to the next. A calendar-based application system could result in applications that are too early or too late.
3) Soil temperature monitoring	Applications made on the basis of average soil temperatures. The data suggests that a soil temp of 70F or higher (6" depth) is roughly correlated with 70% warm season turf cover.	Soil temperature measurements are relatively easy to make, and take into account the year-to-year variations in weather patterns that calendar based strategies ignore.	The relationship between percentage warm season turf cover and soil temperature is approximate, at best. Because this is an indirect way of measuring turf cover, it is more likely to be in error.