Controlling *Poa trivialis* in cool-season fairways

New herbicides provide hope for superintendents trying to control *Poa trivialis*.

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Although used extensively for overseeding warm-season turf in the South, *Poa trivialis* (rough bluegrass) is a troublesome weed on golf courses from the Midwest to the mid-Atlantic states. It is light in color, has poor drought and heat tolerance and, when it is in a perennial stand, it is extremely susceptible to dollar spot. *Poa trivialis* goes dormant or dies in the late summer, leaving thin or patchy fairways and tees. However, it recovers quickly from dormancy, growing aggressively in fall and spring and outcompeting and spreading faster than desirable grasses. *Poa trivialis* is also inadvertently spread through hollowtine aerification, which moves its viable stolons.

Origins of *Poa trivialis* contamination

Poa trivialis contamination can occur through seed contamination or from pre-existing stands. Because the *P. trivialis* cultivars found in many fairways are the newer varieties, seed contamination is thought to be the likely cause (2). In a 1996 study, 30% of 90 creeping bentgrass (*Agrostis stolonifera*) seed samples tested for purity contained *P. trivialis* (2). Since that study, the seed industry has instituted steps to limit seed contamination.

Poa trivialis contamination also comes from pre-existing stands. When Kentucky bluegrass (*Poa pratensis*) seed was brought over from Europe hundreds of years ago, it contained *P. trivialis* seed as a contaminant, making it possible for *P. trivialis* to naturalize across the United States (1). Because it has become naturalized, *P. trivialis* can be found in many areas, including pastures, home lawns, roadsides and streambanks (1). Therefore, the spread of the pre-existing stands of *P. trivialis* could cause contamination on golf courses.

Managing *Poa trivialis*

Cultural practices

Frequent irrigation will likely help *Poa trivialis* withstand some summer stress because it is a shallow-rooted grass. However, practical experience shows that despite regular irrigation, *P. trivialis* will thin during summer stress. *Poa trivialis* is extremely susceptible to dollar spot, and preventive fungicide applications also will help to maintain turf health. However, some of our preliminary data surprisingly suggest that diseases other than dollar spot may cause summer thinning in *P. trivialis*. When fungicide programs were applied May through September to control dollar spot, brown patch, pythium and/or summer patch, only the most aggressive programs were effective (9). Unfortunately, the most effective treatments were higher than label recommendations and could not be used outside of a research setting.

Though modifying cultural practices will help control many weeds, potential cultural controls (other than reduced irrigation) will likely be unsuccessful in favoring the desired turf over *P. trivialis* because the favorable environment is almost identical for both the desired species and *P. trivialis*. Therefore, herbicides likely will be necessary to control *P. trivialis*.

Herbicides

Nonselective herbicides like glyphosate can eliminate patches of *P. trivialis* but require extra

Poa trivialis in a creeping bentgrass fairway in April. Note the slightly faster growth and lighter metallic green color compared to the creeping bentgrass. **Photos by Z. Reicher**

time, effort and money for reseeding or resodding, which might not be necessary if a selective herbicide were used. Our early work with selective herbicides like Prograss, Acclaim, Drive and others proved unsuccessful. Furthermore, preemergence herbicides will not work even after *P. trivialis* goes dormant or dies because it is a perennial regrowing from crowns or stolons.

Two promising selective herbicides for *P. trivialis* control are Velocity (bispyribac-sodium, Valent U.S.A.) and Certainty (sulfosulfuron, Monsanto). Velocity is labeled for selective postemergence control of *P. annua* and *P. trivialis* in creeping bentgrass or perennial ryegrass (*Lolium perenne*) fairways, but not Kentucky bluegrass fairways. Certainty is widely used for yellow nutsedge control, but it is also labeled for control of *P. trivialis* in creeping bentgrass tees and fairways. Our research suggests phytotoxicity is possible on perennial ryegrass depending on rate, but Certainty is safe on Kentucky bluegrass. The objective of this experiment was to determine the most effective selective herbicide strategies for controlling *P. trivialis*.

Application date vs. effectiveness

Treatment	Illinois	Indiana
	% control†	
Velocity 80SP applied in May	99	100 a‡
Certainty 75WDG applied in May	54	-73 b
Velocity 80SP applied in June	97	100 a
Certainty 75WDG applied in June	54	81 a

†Percent control was calculated by: [1 – (% cover in treated plot/% cover in check plot)] × 100. Percent cover in the untreated check plots was 70% in Illinois and 28% in Indiana.
‡Means in a column followed by the same letter are not significantly different.

Table 1. Effect of application date on percent control of *P. trivialis* by Certainty and Velocity 12 weeks after initial application date in 2005. Means are averaged over two rates of each herbicide.

Initial studies

Treatments in the initial studies began in May and June 2005 in Urbana, Ill., and West Lafayette, Ind., on well-maintained fairway-height turf. Both sites were mowed at 0.5 inch (1.3 centimeters) three times per week. The Illinois site was a pre-existing stand of creeping bentgrass with *P. trivialis* contamination, whereas the Indiana site was 100% *P. trivialis*. Treatments included two initial application dates (mid- to late May and mid- to late June), two herbicides (Certainty and Velocity) and two application rates of each herbicide. Herbicide treatments were Certainty 75WDG at 0.25 or 0.50 ounce/acre (17.5 or 35.0 grams/hectare) applied twice at two-week intervals and Velocity 80SP at 1.3 or 2.0 ounces/acre (68.7 or 91.1 grams/hectare) applied four times at two-week intervals. An untreated check also was included. All Certainty treatments included a surfactant at 0.25% volume/volume.

The most important finding in the initial studies was the impact of application date on the effectiveness of Certainty. In Indiana, May applications of Certainty provided no control at 12 weeks after initial treatment, whereas June applications provided 81% control at 12 weeks after initial treatment (Table 1). Research at Rutgers done in growth chambers showed that *P. trivialis* sensitivity to Certainty increases with temperature (4). In this study, high temperatures on the initial May application date were 18 degrees F (10 C) lower than high temperatures on the initial June application date, likely enough to cause the difference in control from May to June applications. The reason why these control differences were not seen in Illinois is most likely because initial spray dates in Illinois were delayed two weeks because of weather. By the time May applications were made, temperatures already had started to warm up and were equivalent to the June initial application temperatures in Illinois and Indiana.

When averaged over all application dates and rates, Velocity outperformed Certainty in the initial studies in both Indiana and Illinois. The likely reasons for Velocity's better performance are that the low rate of Velocity used in these initial studies was at the upper range on the label, whereas the high rate was slightly above the label rates. Velocity is also more aggressive on *P. trivialis* and thus may be a good option for maximizing control in one season. Conversely, Certainty may be a better option for larger populations of *P. trivialis* where more gradual and unobtrusive control is needed.

Almost all Certainty and Velocity treatments caused minor phytotoxicity regardless of location, rate or application date. However, phytotoxicity was short-lived (two weeks) and turf quality was within acceptable levels (ratings of 7 and above on a 1 to 9 scale, with 7 as acceptable). The high rate of Velocity (2.0 ounces/acre [140.1 grams/hectare]) resulted in the most phytotoxicity, but this rate is above the current label rates. Because there were no differences in control between the two rates of Velocity, the rates used in 2006 did not include 2.0 ounces/acre (140.1 grams/hectare). Because herbicides were more effective in 2005 when applied in June, all 2006 treatments were initiated in June.

Follow-up studies

Treatments in the follow-up studies were initiated in June 2006 in five locations including West Lafayette, Ind.; Urbana, Ill.; Dakota Dunes, S.D. (partial shade and full sun); and Verona, Wis. All locations were on fairway-height turf mowed three to four times per week, except in Illinois, which was 2.5-inch (6.4-centimeter) turf mowed twice per week. Four Certainty 75WDG treatments, three Velocity 80SP treatments and an untreated check were included at each location. Certainty treatments included a surfactant at 0.25% (volume/volume) and were applied either two or three times at two-week intervals at 0.25 or 0.50 ounce/acre (17.5 or 35.0 grams/hectare). Velocity treatments were applied four times at two-week intervals at 0.65, 0.98 or 1.3 ounces/acre (45.5, 68.7 or 91.1 grams/hectare).

There was tremendous variation in the performance of Certainty and Velocity among the five locations. In Illinois, Certainty applied three times at 0.50 ounce/acre (35.0 grams/hectare), and Velocity applied four times at 0.98 or 1.3 ounces/acre (68.7 or 91.1 grams/hectare) were the top performers (Table 2). Velocity applied four times at 0.65, 0.98 or 1.3 ounces/acre (45.5, 68.7 or 91.1 grams/hectare) provided the best control in Indiana, whereas two or three applications of Certainty at 0.50 ounce/acre (35.0 grams/hectare) were the best treatments in the full sun in South Dakota. There were no significant differences in control among the herbicide treatments in either Wisconsin or the shaded site in South Dakota.

As in the preliminary studies, phytotoxicity was noticeable at all five locations. However, phy-

Poa trivialis infested with dollar spot and beginning to turn dormant in July in a stand of perennial ryegrass.

% *Poa trivialis* control, 2006

						South Dakota	
			Illinois	Indiana	Wisconsin‡	Sun	Shade‡
Herbicide	Rate (ounces/acre)	No. applications†	8 WAIT§	12 WAIT	12 WAIT	12 WAIT	12 WAIT
Certainty 75WDG	0.25	2	-9 e//	3 c	40	18 b	9
Certainty 75WDG	0.50	2	26 d	8 c	71	64 ab	4
Certainty 75WDG	0.25	3	32 cd	12 c	76	41 b	-17
Certainty 75WDG	0.50	3	90 a	42 bc	90	86 a	30
Velocity 80SP	0.65	4	52 bc	63 ab	52	23 b	4
Velocity 80SP	0.98	4	77 ab	88 a	92	18 b	-17
Velocity 80SP	1.3	4	62 abc	96 a	100	23 b	26
% cover in untreated check			52	98	14	37	37

Note. Percent control was calculated by: [1 – (% cover in treated plot/% cover in check plot)] × 100.
†Herbicides were applied every two weeks.
‡There were no significant differences among means at either the Wisconsin site or the South Dakota shade site.
§WAIT = weeks after initial treatment
//Means in a column followed by the same letter are not significantly different from each other.

Table 2. Percent control of *Poa trivialis* by Certainty and Velocity treatments at five sites in 2006.

New shoots on stolons of apparently dead or dormant *Poa trivialis*. It regrows extensively from stolons, allowing its spread via aerification.

totoxicity did not last longer than two weeks from any of the treatments and was within acceptable levels (ratings of 7 and above on a 1 to 9 scale, with 7 as acceptable).

Why variable control?

Temperature likely affected the performance of Certainty and Velocity in this study. Velocity works best at warmer temperatures of approximately 74 F to 86 F (23 C–30 C) (3). Research also has shown that *P. trivialis* sensitivity to Certainty increases with temperature (4). This would explain poor control from Certainty in the May 2005 application in Indiana, as was discussed earlier. Warmer temperatures probably would have resulted in more-consistent control in Wisconsin and at the South Dakota shaded site in 2006. The temperatures on the initial spray date in Wisconsin were at least 9 degrees F (5 C) cooler than other sites. At the South Dakota shade site, temperatures in the shaded environment may have been low enough to reduce the performance of Certainty and Velocity.

Poa trivialis cultivar also may have played a role because preliminary studies have shown that cultivars differ in their sensitivity to Certainty. The *P. trivialis* cultivar Laser was used in Indiana in both years, and our work shows that Laser is less sensitive to Certainty than other cultivars (5). This could explain the relatively poor control from Certainty in Indiana in both 2005 and 2006, but we are unsure whether it played a role at other sites where the *P. trivialis* populations were preexisting contaminations by unknown cultivars.

Control recommendations

Controlling *Poa trivialis* in creeping bentgrass will be challenging because the physiology, growth patterns and favorable environments are similar for this weed and the desired turf. Thus, recommending a single best strategy for *P. trivialis* control using these herbicides is difficult. We hope that more precise recommendations will result from our future research as well as from the experiences of superintendents.

Current recommendations

Our current recommendations include starting initial applications in June after daytime temperatures exceed at least 70 F (21 C). As far as herbicide and application rates are concerned, we suggest three applications of Certainty at 0.50 ounce/acre (35.0 grams/hectare) at two-week intervals or four applications of Velocity at 0.98 or 1.3 ounces/acre (68.7 or 91.1 grams/hectare) at two-week intervals for most rapid and effective *P. trivialis* control. Realize that we used the 80SP formulation of Velocity, which has since been replaced by the 17.6SP formulation. There appears to be no difference in activity between formulations as a long as equivalent rates of active ingredient are used.

Poa trivialis in this creeping bentgrass stand has thinned, leaving bare patches. *Poa trivialis* in creeping bentgrass is not always obvious, making it difficult to accurately estimate the amount of *P. trivialis* in a given area.

In fairways with significant *P. trivialis* populations, a slower approach may be desired to gradually remove *P. trivialis*. In this case, two to three applications of Certainty at 0.25 ounce/acre (17.5 grams/hectare) potentially could reduce *P. trivialis* over multiple years. This may be especially important if significant *P. annua* populations are also in the fairways. Velocity is extremely effective on both *P. trivialis* and *P. annua* and therefore large voids may unintentionally be created with this herbicide. Though Certainty is effective on *P.*

trivialis, it has little activity on mature *P. annua*, and its effects may not be as noticeable to golfers.

Overseeding

Combining these herbicide strategies with overseeding the desired grass will help discourage the regrowth of surviving *P. trivialis* and improve overall success of control. Creeping bentgrass can be seeded into areas treated with Velocity 10 days after final application (8) and into areas treated with Certainty three weeks after final application (7). Certainty 75WDG applied twice at 0.50 ounce/acre at two-week intervals or Velocity 80SP applied four times at 0.98 or 1.3 ounces/acre (68.7 or 91.1 grams/hectare) at two-week intervals, followed by overseeding with creeping bentgrass allowed the conversion of 100% *P. trivialis* to almost 100% creeping bentgrass in one year (6).

Further studies

Current research at Purdue, including a study funded by The Environmental Institute for Golf and Midwest Regional Turf Foundation, is trying to better understand and control *P. trivialis*. We hope to provide more precise answers for controlling this difficult weed in the near future.

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More detailed information on this research can be found in an article to be published in an upcoming volume of the journal *HortScience* in 2007: "Evaluating bispyribac-sodium and sulfosulfuron for control of roughstalk bluegrass" by D. Morton, D. Weisenberger, Z. Reicher, B. Branham, B. Sharp, R. Gaussoin, J. Stier and E. Koeritz.

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GCM

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Rough height *Poa trivialis* beginning to lay over and mat down, typical of mid-summer.

The research says

- Control of *P. trivialis* in a stand of creeping bentgrass is difficult because physiology, growth patterns and favorable environments are similar for the two grasses.
- Applications of Certainty or Velocity after daytime temperatures exceed at least 70 F (21 C) improved control of *P. trivialis* and safety to creeping bentgrass.
- Three applications of Certainty 75WDG at 0.50 ounce/acre at two-week intervals or four applications of Velocity 80SP at 0.98 or 1.3 ounces/acre at two-week intervals provided most rapid and effective *P. trivialis* control.
- A slower approach to *P. trivialis* control could include two to three applications of Certainty at 0.25 ounce/acre over multiple years.
- Herbicide use combined with overseeding in late summer will improve the success of conversion to creeping bentgrass.