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Guidelines for Control of *Poa annua,* Plus an Update on the Redgum Lerp Psyllid, a New Pest of Eucalyptus

By Wendy Gelernter, Ph.D. and Larry J. Stowell, Ph.D.

Bottom line: There are no miracle cures for control of annual bluegrass, one of the most troublesome and persistent weeds on golf courses today. On overseeded fairways, where poa control still relies heavily on the use of both pre- and post-emergence herbicdes, recent research results indicate that proper timing of herbicide applications can significantly improve and increase the longevity of control. Control of poa on greens relies on both cultural practices and chemical control. However, only two strategies have been shown to eliminate poa from putting greens on a long-term (> 6 years) basis – vigilant, year-round physical removal or periodic fumigation and re-surfacing of greeens.

Like a recurring nightmare with no end in sight, annual bluegrass (*Poa annua*) is a problem weed that golf course superintendents have been grappling with since the 1920s. Since we last visited this topic in May of 1997, however, some small advances have been made—particularly in the areas of poa management on bermudagrass overseeded fairways and development of new bentgrass varieties that can slow the advance of poa onto greens. While we should still expect poa to cause us headaches for a long time to come, incorporation of some of the information presented below will hopefully help downgrade poa's status from that of an out-of-control nightmare to an irritating, but more manageable reality.

POA MANAGEMENT ON GREENS

Physical removal of poa from greens

Poa's short root system makes it possible to effectively remove it from greens using a variety of mechanical, or physical methods. However, there are some drawbacks to this approach. First, it is labor intensive, requiring regular, sometimes even daily, scouting and poa removal. Secondly, because these methods rely on mechanical removal of the poa, the damage produced would be unacceptable on a green with a significant poa infestation. For this reason, physical removal is recommended only on relatively new greens where the poa infestation levels are low (less than 1%).

Out, out damned spot! Probably one of the most obvious methods, but also one of the most labor intensive, calls for physical removal of poa from greens—in plainer terms, hand-weeding. Superintendents have developed their own favorite implements for this approach, including ice picks and knives (Figure 1). Regular scouting and removal of poa is required for this method to be successful.

Turning the heat up: In 1997, Canadian researchers reported that "thermal weed control" could be accomplished by mounting propane-fueled burners on a spray boom, and literally burning poa to death (Desjardins et. al., 1997) on bentgrass fairways. In theory, it is possible to remove poa this way because it is more sensitive to heat damage than bentgrass. While a variety of health, safety and efficacy issues prevented this idea from being widely accepted, a modified version of this approach has proven to be a very effective way of removing small patches of poa from bentgrass greens (Figures 2 and 3).

Figure 1. Physical removal of small patches of poa can be accomplished using ice picks or knives.

Figure 2. Small propane burners can be used to remove small clumps of poa from greens. The flame is applied directly to the poa until the area becomes red-hot (a few seconds).

Figure 3. The resulting area is now free of poa plants, but bentgrass re-colonization will require some time during which the area will appear unattractive.

The role of turf quality

Results from bentgrass variety trials overwhelmingly demonstrate the value of a good performing variety in decreasing the rate of poa invasion on new greens (Fig. 4) . This is common sense—we all intuitively know that the higher the turfgrass quality, the more difficult it is for poa to invade. But until recently, there was little data available to confirm this. However, when we summarized the data (from four, multi-year bentgrass variety trials from Urbana, IL, Blacksburg, VA; Sunnyvale, CA and Costa Mesa, CA), we were able to confirm what we expected: the speed of poa invasion is directly related to the quality of the bentgrass. In other words, the best looking turf had the slowest poa invasion rates, while the worst looking turf had the fastest poa invasion rates (Stowell et. al., 1998).

Some of the bentgrass varieties (such as the Penn "A" and "G" series, Lofts L-93 and Cato) performed well in all of the test locations. Other varieties performed exceptionally well in some, but not all locations. This is why it is important that you rely on data generated in your own geographic region to determine which bentgrass variety is most likely to resist poa invasion on your golf course. Keep in mind, though, that no variety – no matter how high its quality – can save you from poa invasion Even the highest quality bentgrass varieties that were evaluated in this study had some poa invasion within four years after seeding.

These results also highlight an important point. Since poa invasion is slowed when bentgrass quality is high, then cultural practices that enhance quality (proper irrigation, fertility, aeration, traffic management, mowing heights, etc) are also critical in slowing the rate of poa invasion. Conversely, the strategy of "starving" poa by reducing phosphorous inputs will only serve to stress bentgrass, thus making it easier for poa to invade.

The role of greens overseeding programs

The use of periodic bentgrass overseeding as a means of converting primarily poa greens to bentgrass, is a commonly used, but fairly expensive program. In 1995, we conducted two studies that asked whether the benefits of this type of program were worth the costs. The answer, unfortunately, was no. Our data showed that there was no increase in the bentgrass stand when rates of either 1.75 lbs/1000 sq ft (see Table 1 below) or 8.0 lbs/1000 sq ft of bentgrass seed (var. Southshore) were applied. In fact, the treatment that had no seed applied to it had more bentgrass plants than any of the overseeded plots! Even when various chemical treatments were applied in an attempt to limit competition from the poa, overseeding with bentgrass still had no impact. This is because treatments such as high rates of Primo and Scythe acted not only to decrease the existing poa stand, but also to reduce the existing bentgrass.

Figure 4. Poa invasion in Southshore (left) and Penncross (right) bentgrass, four years after bentgrass seeding (1997). Mesa Verde Country Club, Costa Mesa CA, Reed Yenny, superintendent. Note that Southshore, an improved variety, has significantly less poa (an average of 8%) than the older Penncross variety (an average of 25% poa invasion).

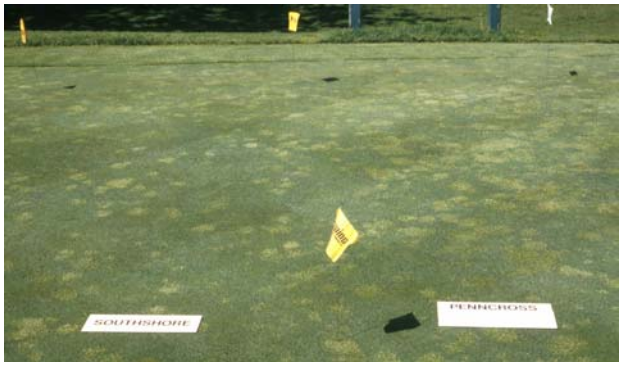

Table 1. Bentgrass overseeding programs for conversion of poa greens. Mesa Verde Country Club, Costa Mesa, CA, Reed Yenny, superintendent. On 5/1/95, turf was aerified and verticut, and chemical treatments were applied in the appropriate plots. Southshore creeping bentgrass seed was applied on 5/3/95, at a rate of 1.75 lbs/1000 sq ft. On 7/26/95 (3 months after overseeding), plots were sampled by collecting five one-inch plugs from each plot. The number of bentgrass plants per five plugs was determined by viewing under a dissecting microscope. Average values followed by the same letter are not significantly different (Fisher's LSD, $p<0.05$).

Treatment	Rate per 1000 sq ft	Avg. # bentgrass plants/5 plugs
Primo L	0.5 oz	4.0 a
Scythe	5% solution	6.0 a
Overseeding	---	11.0 ab
Primo	0.25 oz	12.0 ab
No treatment	---	25.0 b

Why didn't overseeding work to convert the green back to bentgrass? The most likely explanation is that it's just too difficult for the new bentgrass seedlings to compete with poa. Both the existing, high density poa stand itself, as well as the overwhelming number of poa seeds in the soil (estimated at 2 to 14 million seeds per 1000 square feet by Gaussion and Branham, 1989) are formidable adversaries for newly emerging bentgrass plants.

Chemical and biological herbicides on greens

There are only four products that are widely used for control of poa on putting greens. These include three chemical herbicides – dithiopyr (Dimension), bensulide (Betasan) and pronamide (Kerb) and one biological herbicide, XPo (the bacterium, *Xanthomonas campestris*). Each product has its plusses and minuses. Bensulide is widely used on cool and warm season turf (including greens, tees, fairways and roughs) and has the advantage of causing little or no phytotoxicity, even on greens. However, neither bensulide, nor any of the products discussed in this section, are active against all of the hundreds of different varieties (biotypes) of poa that exist on golf courses. Cook (1996) has estimated that there are usually 5 to 20 different poa biotypes on a single putting green! For that reason, control with bensulide is never complete, but it can help keep infestation levels to a more manageable level.

Dithiopyr is also not active on all poa biotypes, and may therefore result in less than optimal control. In addition, when used at the labeled rates, this product can damage some varieties of creeping and Colonial bentgrass, Tifgreen bermudagrass and some fine fescues. Research currently in progress indicates that the use of lower than labeled rates of dithiopyr every two to four weeks over a long-term period, can stress the poa sufficiently to slowly allow bentgrass to re-gain the upper hand. We will keep you posted as more conclusive results become available.

Pronamide is one of the only poa control products labeled for use on bermudagrass greens. However, as for the products above, it is not active on all poa biotypes.

XPo, the newest entry in our roster of poa control products, is based on a living bacterium, *Xanthomonas campestris.* The product is currently being tested in a large-scale, nation-wide demonstration program. As the only biological herbicide available for poa control, this product is very attractive to superintendents wishing to reduce the use of more toxic products. However, results so far appear to be highly variable, based on superintendent comments. We are awaiting final results from this year's testing to determine how and if this product will fit into future poa management strategies.

Biting the Bullet: Plan on Re-Surfacing

While the methods described above can significantly delay poa invasion on putting greens, none of them (with the exception of vigilant physical removal) completely avoids it. For this reason, if physical removal is not a possibility at your course, and if pure bentgrass stands are required, the golf course should be prepared to budget the time and money for greens re-surfacing (including fumigation with chloropicrin or methyl bromide) every 8 – 10 years.

POA MANAGEMENT ON OVERSEEDED FAIRWAYS

Herbicide timing and rate

Controlling poa on fairways that are overseeded with other cool season grasses (such as ryegrass or *Poa trivialis*) presents almost as many problems as control on greens. Products are rarely effective on all poa biotypes, and damage to germinating seedlings of overseeded turf is a real concern. Some of the most effective pre-emergence herbicides have been labeled so restrictively (products such as Barricade and Ronstar have until recently restricted use to four months or more before overseeding) that their benefits couldn't be fully appreciated. And there was uncertainty as to the best timing and rates of the post-emergent product Prograss. Recent research trials conducted by the PACE Turfgrass Research Institute and others have changed this situation for the better, as summarized below.

Pre-emergence herbicides: Testing in California and the southeast has demonstrated that oxadiazon (Ronstar) and prodiamine (Barricade) can be used effectively (up to 85% poa control) 6 to 8 weeks prior to overseeding, with little or no damage to ryegrass seedlings (see Table 2). We will be exploring this same strategy with dithiopyr (Dimension) later this year. Based on the data generated so far, Novartis plans to issue a supplemental label to allow the use of Barricade 6 to 8 weeks before overseeding (rather than the 4 months prior to overseeding stated on the current label). The supplemental Barricade label will issue soon in Texas, Arizona and Nevada, and should issue in California in the next few months. However, there are a few watch-outs:

- When ryegrass is under stress due to poor irrigation uniformity (a frequent problem, especially in windy areas), disease or other factors, damage from pre-emergence herbicides is more likely to occur. For this reason, golf courses with windy or other stressful conditions may want to proceed cautiously with this pre-emerge approach.
- The rate of pre-emergence herbicide used will also determine whether ryegrass is damaged or not. For Barricade 65 G, the company is labeling rates of 0.58 – 1.0 lb/acre. These low rates should help

avoid damage to ryegrass, but you usually don't get something for nothing, and this case is no exception. Because of the lowered rate, control of poa may also be less than optimal.

Post-emergence herbicides: Currently, the commercial standard for poa control on overseeded fairways is ethofumesate (Prograss). Our tests confirmed that when this product is used at the right time (when bermudagrass has ceased actively growing – usually November or December in the West), at the right frequency (2 monthly applications) and at the right rate (0.5 gallons/acre was sufficient), long-term poa control, at levels of 99%, can be achieved (Table 2, Figure 5) without any damage to ryegrass.

Despite its excellent performance, there are concerns when using Prograss as well. These include:

- If Prograss is applied while bermudagrass is still actively growing, the spring/summer transition back to bermudagrass may be significantly slowed. For this reason, Prograss cannot be applied on a calendar schedule – air temperatures and bermudagrass growth and appearance must be closely monitored to determine the optimal application timing.
- Long-term use of Prograss, or any other single herbicide, will likely lead to resistance. In other words, poa biotypes will eventually develop that can tolerate the product. A good, long-term poa control program will therefore rely on a variety of different products – rotated from one year to the next – to insure optimal control.

Figure 5. Control of *Poa annua* on overseeded fairways, following two applications (11/23 and 12/7/98) of Prograss at 0.5 gallons/acre. Sun City West, Palm Desert, CA, Nancy Dickens, superintendent. The turf inside the string lines, which is labeled "10" was treated with Prograss, and contains ryegrass that is 99% free of poa. The lighter colored turf in the foreground and background (outside the string) was not treated with any herbicide, and was covered with poa seedheads. Photo taken on April 14, 1999, 5 months after the last Prograss application.

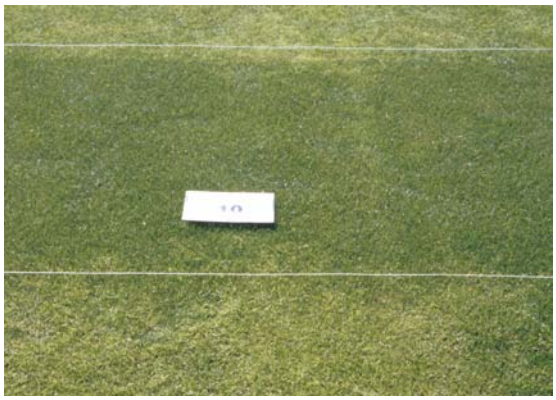

Table 2. Percent Poa Control, Sun City West, Palm Desert, CA, Nancy Dickens, superintendent. Bermudagrass fairways were overseeded with on 10/12/98 with ryegrass. The best performing treatments on each rating date are highlighted in green. Values followed by the same letter are not significantly different (Fisher's LSD, P<0.05).

				PERCENT POA CONTROL			
	Product	**RATE/A**	**Timing before or after overseeding**	**12/8/98**	**1/8/99**	**2/18/99**	**4/6/99**
1	No treatment			0.0a	0.0a	0.0a	0.0a
2	Ronstar 2 G	100 lb	8 wk before	33.3abc	48.3c	78.3cd	43.3de
3	Ronstar 2 G	50 lb	8 wk before	25.0abc	6.7a	26.7b	11.7ab
4	Ronstar 2G	50 lb	8 wk before/8 wk after	8.3ab	18.3ab	35.0b	26.7bcd
5	Barricade 65G	0.75 lb	8 wk before /8 wk after	58.3c	53.3c	75.0c	58.3ef
6	Barricade 65G	1.5 lb	8 wk before	58.3c	81.7d	85.0cd	78.3fg
7	Ronstar 2G	100 lb	6 wk before	58.3c	40.0bc	71.7c	36.7cde
8	Ronstar 2G	50 lb	6 wk before	8.3ab	8.3a	18.3ab	21.7abcd
9	Ronstar 2G	50 lb	6 wk before /6 wk after	8.3ab	6.7a	35.0b	18.3abc
10	Prograss	0.5 ga	6 wk after /8 wk after	41.7bc	90.0d	99.0d	97.7g

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