



Finale kills RRCB. Photo courtesy of Luke Dant

Control Options

What's next for *Poa annua* control?

By Nick Christians, Iowa State University

Annual bluegrass (*Poa annua* L.) is a problem nearly everywhere that the game of golf is played. It is commonly found throughout the world in both cool-season and warm-season regions where it invades well-maintained golf courses and increasingly is found in highly maintained sports turf. *Poa annua* is a weed that is very difficult to control. It has a way of beating almost ev-

erything that we have thrown at it. Both chemical and cultural techniques generally prove to be ineffective and this plant generally finds a way to survive no matter what we do to kill it.

Poa is a cool-season grass that can be identified by its boat-shaped leaf tip, folded vernation and prominent membranous ligule. It is usually classed as a bunch grass

and as a winter annual. *Poa annua* is a highly variable species, however, and many of the things that have been written about it do not prove to be true of all members of the species. A true winter annual should germinate from seed in the late summer to early fall, live through the winter as a mature species, produce a seed crop in the spring and then die. While some types of *Poa annua* are capable of acting in this way, there are types that germinate almost any time during the season and are more perennial than they are annual. Some types also produce stolons and cannot be described as bunch grasses.

POA PROGRESSION

Poa annua is a profuse seed former and can produce seed throughout the season at even the lowest mowing heights. This gives it a competitive advantage over grasses like creeping bentgrass (*Agrostis stolonifera*) that rarely produces seed at close mowing heights. The seed of *Poa annua* can live for years in the soil and will germinate when it is exposed by a ball mark or divot. Another of its competitive advantages is its adaptation to low mowing heights. Very few grasses can tolerate the extremely low mowing heights that this grass can tolerate. It can even produce seed at mowing heights as low as 0.1 inch. This gives it a big advantage over Kentucky bluegrass (*Poa pratensis*) that is poorly adapted to mowing heights below 1.5 inches. The fact that it is a cool-season grass also gives it an advantage over warm-season grasses, such as zoysiagrass and bermudagrass, during cooler times of year when these species are dormant.

Another competitive advantage of *Poa annua* over other grasses is its genetic diversity. There are hundreds, if not thousands of biotypes of this grass around the world. V.W. Cline, Ph.D., University of Minnesota, and Lin Wu, Ph.D., University of California, found that it is even common to observe several different biotypes on a single golf course. W.M. Lush, Victoria, Australia, observed that it is common to find biotypes that are adapted to fairways, others that are best suited to greens, and yet others that predominate on tees. Each biotype has its own specific characteristics that separate it in some way from the others. J.B. Beard, Ph.D., Texas A&M University, found that there are annual bluegrasses termed *Poa annua* var. *annua* L. Timm. that are bunch grasses that act as true winter annuals. There are also types known as *Poa annua* var. *reptans* (Hauskn) Timm. The *reptans* types act as weak perennials and may have stolons. There are many biotypes between these two extremes, some closer to the *annua* types and some closer



The perennial ryegrass fairway of the 2002 Roundup Application Timing Study after conversion to Roundup Ready creeping bentgrass.
Photo courtesy of Luke Dant



Researchers verticut the creeping bentgrass green plots of the 2002 Roundup Application Timing Study. Photo courtesy of Luke Dant

to the *reptans*. Observations of older greens with heavy infestations of *Poa annua* will generally reveal variations in color, texture and time of seedhead production in close proximity to one another. It is often observed that these biotypes respond differently to environmental stresses as well as to herbicides.

POA CONTROL

In 1996, I spent weeks studying more than 85 years of



RRCB treated with Roundup. The conventional creeping bentgrass in the border is killed, yet the RRCB is not damaged. Photo courtesy of Luke Dant

research on attempts to control annual bluegrass in golf course turf. The results were published in an article titled "A Historical perspective of annual bluegrass control." I have also worked for nearly 30 years with a wide variety of herbicides with the potential of controlling this species. During this time, I have tested materials that have been promising in early testing on some types of *Poa annua* and in some environments, only to fail later in more extensive testing over a broader area. This again was due to primarily to the genetic variability. Some types could be controlled and others were tolerant.

The 10 years since the article was published have brought a few new materials, but the results with these products have generally been the same, highly variable. Rimsulfuron (TranXit GTA) is showing some promise as a control of *Poa annua* in Bermudagrass (*Cynodon* spp) turf in the Southern United States. Bispyribac-sodium (Velocity), a new product introduced in 2005, has met with some success as a selective control of *Poa annua* in creeping bentgrass fairways. These new materials will also likely meet with limited success on certain biotypes of *Poa annua*.

Will there ever be a single herbicide that will finally solve the *Poa annua* problem? It is my opinion that this is very unlikely. The perfect herbicide would have to

provide selective pre-emergence and post-emergence control of the many biotypes of *Poa annua* and be safe for use on a variety of competing species. It is very unlikely that such a material will ever be found.

There is some new technology on the horizon; however, that may result in major changes in the turf-grass industry. The rapidly developing science of molecular biology that involves the genetic transformation of plants is bringing about new plant material and methods that have never been available before. Of particular interest, is the recent development of Roundup Ready Creeping Bentgrass (RRCB).

Roundup (glyphosate) is very effective herbicide that non-selectively kills most of the major cool-season and warm-season grasses. It is often used in the renovation process where all existing vegetation is to be killed before reestablishment. Scientists have identified a naturally occurring gene that allows some plants to tolerate the effects of Roundup. They have been able to isolate this gene and place it in plants, like soybean, that normally would be susceptible to Roundup. Roundup ready soybeans are sprayed with the herbicide to eliminate weeds without damage to the soybean.

Scientists at the O.M. Scotts Co. of Marysville, Ohio, in conjunction with scientists from the Monsanto Co. of St. Louis, Mo., have found a way to insert the Roundup ready gene into creeping bentgrass. This RRCB is still experimental and has not been approved for sale as of the spring of 2006. *Poa annua* is susceptible to Roundup, as are most other weeds that compete with creeping bentgrass. If this new technology is released to the market, it has the potential to provide one of the first truly effective means of removing *Poa annua* from creeping bentgrass turf.

At Iowa State University, we have been working with the RRCB since 2002. As I've spoken about the subject at various meeting in the United States, I have received a number of questions concerning the new technology.

CONTROL OPTIONS

The following are representative of these questions.

READY YOURSELVES

- **How good are the cultivars that contain the Roundup Ready gene?**

While the new bentgrasses have not been extensively tested under actual playing conditions, the ones that I have worked with at both fairway height and green height have good density, color and overall quality. It appears that these new grasses will be quite competitive with existing cultivars once they are released and I believe that end users will be pleased with their quality.

- **What will it cost?**

The cost of the seed is yet to be established. There is also some question as to whether the seed will be priced by the pound or whether the golf courses where it is established will be licensed for a certain number of square feet or acres of RRCB. It is likely to be priced competitively so that it is not limited to high budget operations only.

- **Is RRCB more susceptible to disease than conventional bentgrasses?**

This is an often-asked question. While testing has been limited, I have not observed any additional susceptibility to disease over my four years of working with RRCB.

- **How would I kill RRCB if I wanted to?**

Finale (glufosinate) is another non-selective herbicide that will kill bentgrass. The RRCB is susceptible to glufosinate and will die after contact. We also tested other experimental products not currently used on bentgrass and found that mesotrione and Arsenal (imazapyr) were also quite effective at killing RRCB.

- **Will Poa Annua develop Roundup resistance?**

The gene that protects plants from Roundup does exist in nature and it is possible that over the years Roundup resistant *Poa annua* could be found. As mentioned earlier, the genetic diversity of *Poa annua* seems to always give it the edge over almost anything we use to control it. Even if that were to happen, RRCB has the potential to provide many years of *Poa annua* free greens, tees and fairways. The science that created this technology will also continue to develop new techniques and products that will hopefully allow us to keep ahead of *Poa annua* once it's under control. I still would not count *Poa annua* out as a problem in the future.

- **What is the best way to convert to RRCB?**

The objective of the work at Iowa State University has been to develop procedures for the rapid conversion of greens and fairways to the new grasses with a minimum amount of down-time for the golf course. We have found that it is very important to remove the competition of the conventional grasses as early as possible in the conversion process. If conventional grasses are allowed to compete with the newly germinated seedlings of RRCB for several weeks following germination, the conversion process will be slowed.

In addition to converting conventional creeping bentgrass greens and fairways, we have also worked on the conversion of Kentucky bluegrass and perennial ryegrass fairways. Seeding directly into existing turf, combined with Roundup applications to kill the existing turf before it competes with the new RRCB appears to be the most effective method of conversion. We found the conversion of fairway height turf to be much easier than converting green height turf.

The development of RRCB is the first of what is likely to be many new developments that the expanding field of molecular biology will bring in future years. It's an exciting time to be involved in the turf industry. **GM**

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