Poa annua Infestation in Sod

What Golf Superintendents

*Annual bluegrass (*Poa annua *L.) has long been the most serious weed problem in highly maintained turf. Annual bluegrass possesses a poorly developed root system and generally won't persist through an entire summer of Midwest conditions.*

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Historically, annual bluegrass (AB) has been considered a problem in turf on golf courses and athletic fields. Irrigation has been identified as a key factor in the invasion of AB into desirable turfs. Turfs that are not irrigated rarely have a serious AB problem. This perhaps explains the increase in annual bluegrass in sod production fields, as sod growers have gradually increased their level of maintenance over the past 20 years. Fields that were not irrigated often during the summer are probably receiving more frequent irrigation than in the past. Sod growers have also ventured into specialty turfgrasses that require higher levels of maintenance, such as bentgrass mown at 0.4″ or less for golf course use or elite bluegrass blends for sports turf use. The higher level of maintenance on one portion of a farm will increase the problem across the entire farm since equipment, foot and vehicular traffic, and animals can easily spread AB seed.

In recent years, we have fielded many calls from sod growers with questions on the control of AB. Golf turf managers have asked, "How can I eradicate *Poa* that came with recently purchased sod?" The following is a review of some of the cultural approaches to managing AB in sod as well as highlights from some of the research that has been conducted with funds granted by Turf Producers International. Essentially, the main reason that AB is so difficult to control is that there does not exist a selective, postemergence herbicide to remove AB from cool-season turfs. Should such a product be discovered, AB will be considered a turf weed not unlike dandelion or crabgrass—troublesome, but nothing to lose sleep over. Until then, sod growers must employ a variety of approaches, none of which will provide completely satisfactory results.

The Problem with Annual Bluegrass

In a nutshell, AB is a serious problem because of its ability to produce copious quantities of seed. Once an area becomes infested with AB, the seed populations become so high that subsequent plantings are always infested with AB. Once the problem reaches this point, it will surely continue.

Populations of AB seed in the soil of heavily infested turfs can be truly staggering. Estimates from golf course turfs have yielded numbers of seed as high as 8 to 11 million viable seeds per thousand square feet. Considering that Kentucky bluegrass is often seeded at 2 to 4 million seeds per thousand square feet, it is no wonder that annual bluegrass will end up a significant portion of the turf.

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Production: Course Should Know

Annual bluegrass infestations tend to show an exponential population increase. In other words, a new sod field, one that has been in corn or soybeans for the last 25 years and is converted into sod production, will have relatively little to no AB when first planted to sod. Over time, AB is gradually introduced into the field through contaminated seed, animals or foot or vehicular traffic. Since AB is self-fertile, one plant is enough to begin producing seed. AB is also unique in that the seed can ripen off the plant. So, mowing a newly formed seedhead does not mean that viable seed won't be produced. One plant leads to many more plants. After several years of low-level AB infestations, populations rise exponentially. It is at this point that many sod growers become concerned; however, by now it is too late and the problem will persist for many years.

Thus, there are two approaches to dealing with AB. First, how do you keep it from becoming a problem in fields where the problem doesn't exist? And second, if AB is a problem, what can you do to minimize its occurrence? As you might guess, these are two entirely different strategies.

Annual Bluegrass Research Conducted at the University of Illinois

During our research on the soil fumigant Basamid, we developed a technique to estimate the number of viable annual bluegrass seeds in the soil. This procedure was done in the greenhouse from soil cores collected in the field. We decided to extend this approach to determine the extent of the problem in sod producers' fields.

Beginning in the summer of 2001, we asked sod producers in the central United States to submit soil cores from fields that they would consider free of significant AB infestation as well as fields that they considered contaminated. We then took these cores and sectioned them in 0.4″ intervals. The soil from each section was air-dried, ground and topdressed onto sterilized soil in small flats in the greenhouse. The flats were placed under a mist system for 21 days to encourage AB germination. After 21 days, the numbers of emerged AB seedlings were counted and this number was used as an estimate of the number of AB seeds in each soil section.

We received samples from 11 sod producers with all of the producers hailing from Illinois or Indiana. The results were all over the board. Most of the cores that we received were 4″ in diameter. One sample was estimated to contain more than 1,000 viable seeds from that single 4″ core, and that was only from the top 0.4″! If we assume that the rest of the field is infested at the same level, then that particular field could contain more than 11 million seeds per thousand square feet. Other samples from other fields had much lower numbers of viable seeds, and some farms sent samples that had no viable AB seeds. Of the 45 samples we analyzed, 23 of the samples had no viable AB seed. So, approximately half the samples appeared free of AB contamination. Of the 22 samples that did have AB contamination, most of the AB seed

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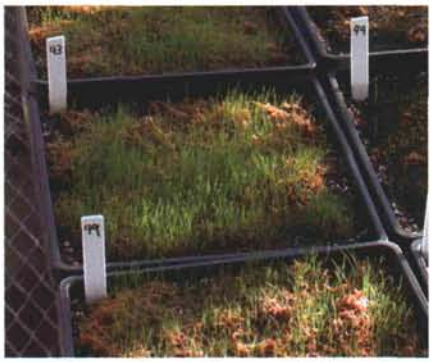
was confined to the top 0.4″. On a seed-number basis, and averaged over all samples containing AB seed, 83% of the viable seed in the whole sample was in the top 0.4″ of soil. Another 8.5% was in the second 0.4″. More than 90% of the viable AB seed in infested sites is located in the top 0.8″ of soil (Figure 1).



View of greenhouse trial used to estimate viable annual bluegrass in the top 1/2″ of soil. Note the tremendous density of annual bluegrass seedlings. The flat pictured was topdressed with the surface 1/2″ of soil from an area of less than two-tenths of a square foot.

The information we collected leads to several interesting points. First, even though 22 of the samples contained no viable seeds, this does not mean that these fields are completely free of AB. In fact, it is highly unlikely they are totally free of annual bluegrass seed. A 4″ diameter core is not representative of an entire field and a different sampling methodology needs to be employed in order to make inferences regarding an entire field. These fields are undoubtedly low in AB populations, but AB populations may be increasing nonetheless. Second, AB has an amazing ability to produce viable seed under turf culture. While I think of crabgrass and dandelion as being troublesome turfgrass weeds, these plants were hardly ever observed in our assays and if present there was usually only one or two seeds per sample. The numbers of AB seeds in some of these samples were truly amazing.

Management Implications

When fields become infested with AB, a grower has several options. First, one or two crops sold as lower-quality sod, and cut as thick as possible when harvested, should go a long way towards reducing the extent of the problem. It is clear that most of the seed is at or near the soil surface.

Fumigation is another option that should be explored on high-value acreage like bentgrass sod. Note, however, that in our experience fumigation rarely kills more than 70 to 80% of the soil seed reservoir. A reduction of 70 to 80% sounds impressive, but when initial seed levels are at 10 million, an 80% reduction still leaves 2 million viable seeds. The reason that fumigation only controls 70-80% is because some of the seed is so deeply dormant that it is not respiring enough to take in sufficient amounts of the fumigation gas to actually kill the seed. So, while some seed is not killed, what is left behind is not capable of germinating right away. Fumigation thus creates a "*Poa*-free" germination period where competition during establishment is minimized. However, in my experience this window closes very quickly so seeding needs to be planted as soon as possible after fumigation. Fumigation can allow the sod grower to produce a crop that is nearly free of AB but will still have a significant quantity of viable AB seed near the soil surface. Subsequent harvest and removal will further reduce the extent of the problem.

Some sod growers attempt to bury the problem by plowing under infested fields. This practice seems destined to make matters worse. Plowing doesn't bury the entire problem, just a portion of it. Subsequent plowing not only buries more seed, but also turns up seed from previous plowings. Our soil data shows that is much better to turn over the crop quickly, thereby removing as much of the problem as possible from the sod. Tillage of infested fields should be kept to minimum following harvest, and seed should be planted as early in the planting season as possible. This recommendation must be balanced with the knowledge that tillage is useful for suppression of certain diseases and the reduction of compaction. Annual bluegrass germinates in the cooler conditions of the spring and fall; a late-planted field is ripe for AB invasion. I'm convinced that AB makes most of its ingress into a turf in the late fall and early spring. When grasses like Kentucky bluegrass and creeping bentgrass aren't growing, AB is. Mild winters tend to lead to an AB explosion, not because of a lack of winterkill, as many think, but because of conditions that allow it to germinate and put on some growth while other grasses are not growing. Infested fields should be harvested early in the season and planted in early August and fertilized liberally so that the bluegrass is as far along as possible by the time cooler fall weather hits. A competitive, completely filled-in turf is the best defense against AB.

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The research we conducted at the University of Illinois has helped frame the problem of AB in sod production. With a better understanding of how much seed is produced and where it exists, sod producers can alter their management strategies to reduce the occurrence of this troublesome weed. Obviously, successful management of AB by sod producers has enormous implications for golf course superintendents.

Coming soon: Herbicidal and fumigation approaches to controlling annual bluegrass.